# REPORT OF AIR POLLUTION SOURCE TESTING OF AN ETHYLENE OXIDE EMISSION-CONTROL SYSTEM OPERATED BY STERIGENICS U.S., LLC. IN QUEENSBURY, NEW YORK ON OCTOBER 24, 2017

Submitted to:

# NEW YORK DEPARTMENT OF ENVIRONMENTAL CONSERVATION P.O. Box 220 232 Hudson Street Warrensburg, New York 12885-0220

Submitted by:

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NYDEC Permit Number 5-5344-00029/00011

Prepared by:

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**December 21, 2017** 

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#### **TEST DATE**

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#### 1.0 INTRODUCTION

On Monday, October 23, 2017, ECSi performed air pollution source testing of an ethylene oxide (EtO) emission-control system operated by Sterigenics U.S., LLC. in Queensbury, New York. The control device tested is a Donaldson EtO Abator catalytic oxidizer, which is currently used to control emissions from ten EtO sterilizer backvents and five aeration rooms/cells. The purpose of the testing program was to evaluate compliance with EPA requirements under the current National Emissions Standards for Hazardous Air Pollutants (NESHAP), and with the conditions established in the permit (Number 5-5344-00029/00011) granted to Sterigenics US, LLC. by the New York Department of Environmental Conservation (NYDEC).



#### 2.0 EQUIPMENT

The EtO gas-sterilization system is comprised of eleven commercial sterilizers, all discharging through liquidring vacuum pumps to a packed-tower acid scrubber emission control device. In compliance with NYDEC and USEPA requirements, and all aeration room vents are discharged to a Donaldson EtO Abator catalytic oxidizer emission control device. In compliance with NYDEC requirements, all chamber exhaust vents ("backvents") are discharged to the same Donaldson EtO Abator catalytic oxidizer emission control device. The gas-sterilization and emission-control equipment consists of the following:

- Eleven Gas Sterilizers, one 26-pallet chamber (3003 cubic feet), four 13-pallet (1333 cubic feet), four 8-pallet (two: 1155 cubic feet; two: 1200 cubic feet), and two 3-pallet (350 cubic feet) capacity, each comprised of a steam-heated sterilization chamber, a recirculating vacuum pump chamber evacuation system, a chamber backvent valve, and a fugitive emissions exhaust hood;
- Five Aeration Rooms, three 48-pallet (11,340 cubic feet), one 685-pallet (189,642 cubic feet), and one 3764 cubic feet capacity, each comprised of a heated aeration room and an aeration room exhaust system.

Sterilizer vacuum pump emissions are controlled by:

One Ceilcote packed tower acid scrubber, Model SPT-42-120, equipped with a bed of No. 1
Tellerette packing, a 5000 gallon reaction tank/reservoir, a scrubber fluid recirculation pump, and an
exhaust blower.

Sterilizer backvent and aeration emissions are controlled by:

 One Donaldson EtO Abator System, operated at approximately 6,000 SCFM, equipped with a prefilter, a steam heater, an exhaust gas heat exchanger, a reactive catalyst bed, and an exhaust blower.



#### 3.0 TESTING

EtO source testing was conducted in accordance with the procedures outlined in USEPA CFR40, Part 63.365. EtO emissions monitoring for each test run was conducted simultaneously at the inlet and outlet of the catalytic oxidizer during chamber backvent, and during a one-hour interval of the 24-hour aeration process. A total of three chamber backvent test runs, and three one-hour aeration test runs, were performed.

During backvent and aeration testing, EtO emissions at the inlet and the outlet of the catalytic oxidizer were determined using direct source sample injection into the gas chromatograph (GC). All backvent and aeration testing was performed using freshly sterilized product. The testing program was conducted in accordance with the procedures outlined in the following sections.



#### 4.0 RULE/COMPLIANCE REQUIREMENTS

The EtO gas-sterilization system at Sterigenics U.S., LLC. was tested to determine compliance with the current federal EPA National Emissions Standard for Hazardous Air Pollutants (NESHAP) for ethylene oxide, and with the requirements specified in the NYDEC Permit. The current testing was performed to demonstrate continued compliance with the following requirements:

- The emissions from the sterilization chamber exhaust vents (backvents) must be discharged to control equipment with an EtO emission-reduction efficiency of at least 99.0% by weight.
- The emissions from the aeration process must be discharged to control equipment with an EtO
  emission-reduction efficiency of at least 99.0% by weight, or which reduces the EtO concentration at
  the emission-control outlet to less than 1 ppm.

Testing is required to demonstrate compliance with these requirements. Source testing of the emission-control device is conducted annually.

#### 5.0 TEST METHOD REFERENCE

#### 5.1 INTRODUCTION

The testing procedures outlined herein are based on USEPA source-sampling methods. EtO control efficiency and mass-emissions testing were conducted by USEPA CFR40, Part 63.365, and in accordance with NYDEC requirements. EtO emissions monitoring for each test run was conducted simultaneously at the inlet and outlet of the catalytic oxidizer during chamber backvent, and during a one-hour interval of the 24-hour aeration process. A total of three chamber backvent test runs, and three one-hour aeration test runs, were performed.

During backvent and aeration testing, EtO emissions at the inlet and the outlet of the catalytic oxidizer were determined using direct source sample injection into the gas chromatograph (GC). All backvent and aeration testing was performed using freshly sterilized product.

Operation and documentation of process conditions were performed by personnel from Sterigenics using existing monitoring instruments installed by the manufacturer on the equipment to be tested. In accordance with the procedures established in USEPA CFR40, Part 63, Subpart O, the following parameter was recorded: catalyst bed operating temperature. Process condition data is noted in Tables 1 and 2.

#### 5.2 VOLUMETRIC FLOW MEASUREMENT

Exhaust gas flow at the outlet of the catalytic oxidizer was determined by EPA Method 2C using a standard pitot tube and an inclined-oil manometer. Sampling ports were installed in accordance with EPA Method 1, and were located far enough from any flow disturbances to permit accurate flow measurement.

Temperature measurements were obtained from a type K thermocouple and thermometer attached to the sampling probe. Exhaust gas composition was assumed to be air and small amounts of water vapor. Water vapor was negligible, at about 3 percent.



#### 5.3 CONTROL EFFICIENCY AND MASS EMISSIONS MEASUREMENT

During backvent and aeration testing, EtO emissions at the inlet and outlet of the catalytic oxidizer were determined using direct source sample injection into the GC. The mass of EtO emitted to the inlet and from the outlet was determined using the equation shown below in Section 5.9. Mass-mass control-efficiency of EtO during the backvent and aeration phases was calculated by comparing the mass of EtO vented to the system inlet to the mass of EtO vented from the system outlet.

During the backvent and aeration phases, vented gas was analyzed by an SRI, Model 8610, portable gas chromatograph (GC), equipped with the following: dual, heated sample loops and injectors; dual columns; and dual detectors. A flame ionization detector (FID) was used to quantify inlet EtO emissions, and a photoionization detector (PID) was used to quantify low-level EtO emissions at the emission-control device outlet.

#### 5.4 SAMPLE TRANSPORT

Source gas was pumped to the GC at approximately 1000 cubic centimeters per minute (cc/min) from the sampling ports through two lengths of Teflon<sup>®</sup> sample line, each with a nominal volume of approximately 75 cubic centimeters (cc) and an outer diameter of 0.25 inch. At the inlet, the sampling port was located in the common backvent/aeration discharge duct, upstream of the oxidizer. At the outlet of the catalytic oxidizer, sampling ports were located in the exhaust stack downstream of the catalyst bed.

#### 5.5 GC INJECTION

Source-gas samples were then injected into the GC which was equipped with two heated sampling loops, each containing a volume of approximately 2cc and maintained at 100 degrees Celsius (C). Injections occurred at approximately five minute intervals during the aeration-phase testing. Helium was the carrier gas for both the FID and PID.

#### 5.6 GC CONDITIONS

The packed columns for the GC were both operated at 80 degrees C. The columns were stainless steel, 6 feet long, 0.125 inch outer diameter, packed with 1 percent SP-1000 on 60/80 mesh Carbopack B.



During the analysis, the FID was operated at 250 degrees C. The support gases for the FID were helium (99.999% pure), hydrogen (99.995% pure) and air (99.9999% pure). Any unused sample gas was vented from the GC system back to the inlet of the control device being tested.

#### 5.7 CALIBRATION STANDARDS

The FID was calibrated for mid-range part-per-million-by-volume (ppmv) level analysis using gas proportions similar to the following:

- 1) 1,000 ppmv EtO, balance nitrogen
- 2) 100 ppmv EtO, balance nitrogen
- 3) 50 ppmv EtO, balance nitrogen (audit gas)
- 4) 10 ppmv EtO, balance nitrogen
- 5) 1 ppmv EtO, balance nitrogen

The PID was calibrated for low-range ppmv level analyses using gas proportions similar to the following:

- 1) 100 ppmv EtO, balance nitrogen
- 2) 50 ppmv EtO, balance nitrogen (audit gas)
- 3) 10 ppmv EtO, balance nitrogen
- 4) 1 ppmv EtO, balance nitrogen

Each of these calibration standards was in a separate, certified manufacturer's cylinder. Copies of the calibration gas laboratory certificates are attached as Appendix I.

#### 5.8 SAMPLING DURATION

Backvent testing was performed in conjunction with normal production operations, during the chamber exhaust venting which is conducted for each sterilization chamber upon conclusion of the sterilization cycle, immediately prior to and during chamber unloading. Backvent sampling duration was 15 minutes for each of the three test runs.

Since aeration is a 24-hour process at this facility, with constant discharge flow from the aeration chambers to the emission-control system, aeration testing consisted of three 1-hour test runs. Each test run was performed with freshly sterilized product in the aeration chambers.

#### 5.9 CONTROL-EFFICIENCY/MASS-EMISSIONS CALCULATIONS

Mass emissions of EtO during aeration were calculated using the following equation:

MassRate = (VolFlow)(MolWt)(ppmv EtO/10<sup>6</sup>)/(MolVol)

Where:

MassRate = EtO mass flow rate, pounds per minute

VolFlow = Corrected volumetric flow rate, standard cubic feet per minute at 68 degrees F

MolWt = 44.05 pounds EtO per pound mole

ppmv EtO = EtO concentration, parts per million by volume

10<sup>6</sup> = Conversion factor, ppmv per "cubic foot per cubic foot"

MolVol = 385.32 cubic feet per pound mole at one atmosphere and 68 degrees F

Mass-mass control efficiency of EtO was calculated for aeration. Results of the control-efficiency testing are presented in Tables 1 and 2.



#### 6.0 TEST SCENARIO

The backvent and aeration testing was performed during normal process load conditions. Three backvent and three aeration test runs were conducted in series to verify the performance of the emission-control device. The testing schedule was as follows:

- 1) Testing equipment was set up and calibrated.
- 2) Aeration Phase Test Run #1 was conducted with freshly sterilized product in aeration. Sampling was performed at the inlet and the outlet of the catalytic oxidizer.
- 3) Backvent Phase Test Run #1 was conducted with one freshly sterilized production load. Sampling was performed at the inlet and the outlet of the catalytic oxidizer.
- 4) Backvent Phase Test Run #2 was conducted with one freshly sterilized production load. Sampling was performed at the inlet and the outlet of the catalytic oxidizer.
- 5) Aeration Phase Test Run #2 was conducted with freshly sterilized product in aeration. Sampling was performed at the inlet and the outlet of the catalytic oxidizer.
- 6) Backvent Phase Test Run #3 was conducted with one freshly sterilized production load. Sampling was performed at the inlet and the outlet of the catalytic oxidizer.
- 7) Aeration Phase Test Run #3 was conducted with freshly sterilized product in aeration. Sampling was performed at the inlet and the outlet of the catalytic oxidizer.
- 8) Post calibration check was performed, testing equipment was packed.



#### 7.0 QA/QC

#### 7.1 FIELD TESTING QUALITY ASSURANCE

At the beginning of the test, the sampling system was leak checked at a vacuum of 15 inches of mercury. The sampling system was considered leak free when the flow indicated by the rotameters fell to zero.

At the beginning of the test, a system blank was analyzed to ensure that the sampling system was free of EtO. Ambient air was introduced at the end of the heated sampling line and drawn through the sampling system line to the GC for analysis. The resulting chromatogram also provided a background level for non-EtO components (i.e. ambient air, carbon dioxide, water vapor) which are present in the source gas stream due to the ambient dilution air which is drawn into the emission-control device, and due to the destruction of EtO by the emission-control device which produces carbon dioxide and water vapor. This chromatogram, designated AMB, is included with the calibration data in Appendix A.

#### 7.2 CALIBRATION PROCEDURES

The GC system was calibrated at the beginning and conclusion of each day's testing. Using the Peaksimple II analytical software, a point-to-point calibration curve was constructed for each detector. A gas cylinder of similar composition as the calibration gases, but certified by a separate supplier, was used to verify calibration gas composition and GC performance.

All calibration gases and support gases used were of the highest purity and quality available. A copy of the laboratory certification for each calibration gas is attached as Appendix I.



#### 8.0 TEST RESULTS

The catalytic oxidizer was found to have an average EtO control efficiency of 99.92 percent for backvent, and an average EtO control efficiency of 99.86 percent for aeration. During the testing the catalytic oxidizer was operated at 291 degrees during both backvent and aeration. In accordance with state and federal requirements, backvent and aeration discharge streams must be vented to control equipment with an EtO emission-reduction efficiency of at least 99 percent by weight. The catalytic oxidizer met this requirement.

The test results are summarized in Tables 1 and 2. These tables include results for EtO control efficiency and mass emissions of the emission-control device. Chromatograms and chromatographic supporting data are attached as Appendices A through G. Copies of field data and calculation worksheets are attached as Appendix H.



# **TABLES**

# TABLE 1 ETHYLENE OXIDE CONTROL EFFICIENCY - AERATION OF AN ETHYLENE OXIDE EMISSION CONTROL DEVICE OPERATED BY STERIGENICS U.S., LLC. IN QUEENSBURY, NEW YORK ON OCTOBER 24, 2017

RUN <u>NUMBER</u>	INJECTION <u>TIME</u>	INLET ETO CONC. (PPM)(1)	OUTLET ETO CONC. (PPM)(2)	ETO CONTROL EFFICIENCY
1(3)	847	5.25	0.01	99.8095
1	852	5.55	0.01	99.8198
1	857	5.30	0.01	99.8113
1	902	5.05	0.01	99.8020
1	907	5.11	0.01	99.8043
1	912	5.22	0.01	99.8084
1	917	4.94	0.01	99.7976
1	922	4.84	0.01	99.7934
1	927	5.35	0.01	99.8131
1	932	5.74	0.01	99.8258
1	937	5.29	0.01	99.8110
1	942	5.05	0.01	99.8020
2(4)	1027	6.32	0.01	99.8418
2	1032	6.28	0.01	99.8408
2	1037	6.76	0.01	99.8521
2 2	1042	6.66	0.01	99.8498
2	1047	7.36	0.01	99.8641
2	1052	7.60	0.01	99.8684
2	1057	7.92	0.01	99.8737
2	1102	8.99	0.01	99.8888
2	1107	8.00	0.01	99.8750
2	1112	8.30	0.01	99.8795
2	1117	8.02	0.01	99.8753
2	1122	7.92	0.01	99.8737
3(5)	1149	9.21	0.01	99.8914
3	1154	9.13	0.01	99.8905
3	1159	9.17	0.01	99.8909
3 3	1204	9.14	0.01	99.8906
	1209	9.38	0.01	99.8934
3	1214	9.30	0.01	99.8925
3	1219	9.18	0.01	99.8911
3	1224	9.40	0.01	99.8936
3	1229	9.31	0.01	99.8926
3	1234	9.29	0.01	99.8924
3	1239	9.34	0.01	99.8929
3	1244	<u>9.06</u>	<u>0.01</u>	<u>99.8896</u>
TIME-W	EIGHTED AVERAGE:	7.326	0.0100	99.8551

NYDEQ REQUIRED CONTROL EFFICIENCY: 99%

#### Notes:

- (1) PPM = parts per million by volume
- (2) 0.01 ppm is the quantification limit for the detector used at the outlet.
- (3) Aeration Phase Test Run #1 started at 08:45, ended at 09:45.
- (4) Aeration Phase Test Run #2 started at 10:25, ended at 11:25.
- (5) Aeration Phase Test Run #3 started at 11:47, ended at 12:47.
- (6) During aeration testing, the average recorded catalyst bed temperature was 291 deg F

# TABLE 2 ETHYLENE OXIDE CONTROL EFFICIENCY - BACKVENT OF AN ETHYLENE OXIDE EMISSION CONTROL DEVICE OPERATED BY STERIGENICS U.S., LLC. IN QUEENSBURY, NEW YORK ON OCTOBER 24, 2017

RUN <u>NUMBER</u>	INJECTION <u>TIME</u>	INLET ETO CONC. (PPM)(1)	OUTLET ETO CONC. (PPM)(2)	ETO CONTROL EFFICIENCY
1(3)	1010	217	0.01	99.9954
1	1011	78.9	0.01	99.9873
1	1012	51.5	0.01	99.9806
1	1013	46.8	0.01	99.9786
1	1014	43.6	0.01	99.9771
1	1015	41.3	0.01	99.9758
1	1017	39.8	0.01	99.9749
1	1018	37.9	0.01	99.9736
1	1019	36.9	0.01	99.9729
1	1020	35.4	0.01	99.9718
1	1022	30.1	0.01	99.9668
1	1023	19.9	0.01	99.9497
2(4)	1132	9.48	0.01	99.8945
2 2 2 2 2 2 2 2 2 2	1133	10.3	0.01	99.9029
2	1134	9.06	0.01	99.8896
2	1136	8.93	0.01	99.8880
2	1137	9.00	0.01	99.8889
2	1138	8.91	0.01	99.8878
2	1139	8.99	0.01	99.8888
2	1140	9.12	0.01	99.8904
2	1141	9.20	0.01	99.8913
2	1142	9.28	0.01	99.8922
2	1144	9.19	0.01	99.8912
2	1145	9.21	0.01	99.8914
3(5)	1251	8.11	0.01	99.8767
3	1252	18.5	0.01	99.9459
3 3	1253	10.0	0.01	99.9000
3	1254	9.57	0.01	99.8955
3	1255	8.98	0.01	99.8886
3	1256	9.13	0.01	99.8905
3	1258	9.05	0.01	99.8895
3	1259	9.03	0.01	99.8893
3 3 3 3 3	1300	9.18	0.01	99.8911
3	1302	8.80	0.01	99.8864
3	1303	8.52	0.01	99.8826
3	1304	<u>8.52</u>	<u>0.01</u>	<u>99.8826</u>
TIME-W	EIGHTED AVERAGE:	25.20	0.0100	99.9200

NYDEQ REQUIRED CONTROL EFFICIENCY:

99%

#### Notes:

- (1) PPM = parts per million by volume
- (2) 0.01 ppm is the quantification limit for the detector used at the outlet.
- (3) Backvent Phase Test Run #1 started at 10:09, ended at 10:24.
- (4) Backvent Phase Test Run #2 started at 09:53, ended at 10:08.
- (5) Backvent Phase Test Run #3 started at 12:50, ended at 13:05.
- (6) During backvent testing, the average recorded catalyst bed temperature was 291 deg F

# **APPENDICES**



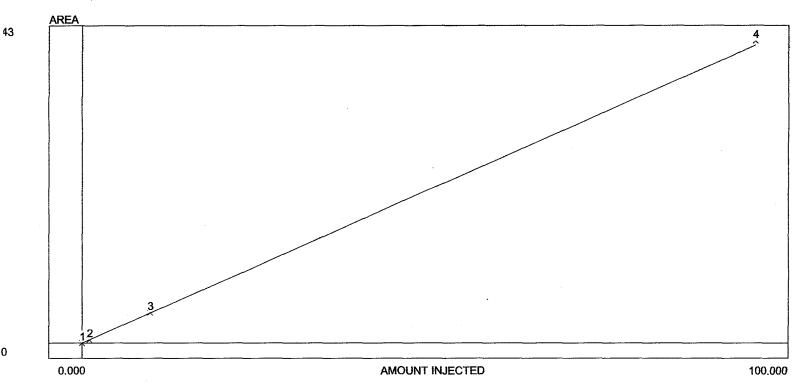
#### **APPENDIX A**

**Calibration Data** 



Peak	Name	Start	End	Calibration	Int.Std	Units
1	Dead Vol / Air	0.000	0.300		0.000	
2	Ambient H2O	0.300	0.430		0.000	
3	Ethylene Oxide	0.430	0.550	C:\peak359\1Ste	r:0.0007.c	appm
4	Acetaldehyde	0.550	0.800		0.000	•
5	CO2	0.800	1.000		0.000	

Calibration file: C:\peak359\1SterQ2017.cal



Avg slope of curve: 0.42 Y-axis intercept: -0.00 Linearity: 1.00 Number of levels: 4

SD/rel SD of CF's: 0.2/66.7

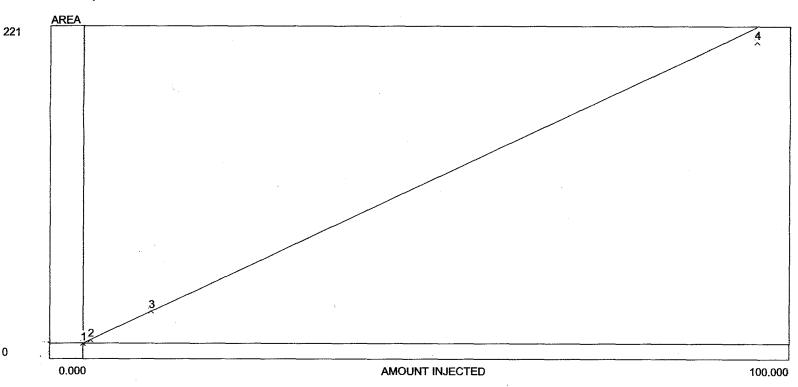
Y=0.4203X r2: 1.0000

Last calibrated: Mon Oct 23 13:17:46 2017

Lvl. Area/ht.		Amount	CF	Current	Previous #1Previous #2	
1	0.000	0.000	0.000	0.000	N/A	N/A
2	0.451	1.100	0.410	0.451	N/A	N/A
3	4.290	10.100	0.425	4.290	N/A	N/A
4	42.600	100.000	0.426	42.600	N/A	N/A

Peak	Name	Start	End	Calibration	Int.Std	Units
1	Dead Vol / Air	0.000	0.300		0.000	
2	Ambient H2O	0.300	0.430		0.000	
3	Ethylene Oxide	0.430	0.550	C:\peak359\2Ster	r0.0007.c	appm
4	Acetaldehyde	0.550	0.800		0.000	
5	CO2	0.800	1.000		0.000	

#### Calibration file: C:\peak359\2SterQ2017.cal



Avg slope of curve: 2.32 Y-axis intercept: 0.00 Linearity: 1.00 Number of levels: 4 SD/rel SD of CF's: 1.2/66

SD/rel SD of CF's: 1.2/66.8

Y=2.3161X r2: 1.0000

Last calibrated: Mon Oct 23 13:17:06 2017

Lvl. Area/ht.		Amount	CF	Current	Previous #1Previous #2	
1	0.000	0.000	0.000	0.000	N/A	N/A
2	2.620	1.100	2.382	2.620	N/A	N/A
3	23.800	10.100	2.356	23.800	N/A	N/A
4	221.000	100.000	2.210	221.000	N/A	N/A

Data file: 2SterQ2017-Amb.CHR (c:\peak359)
Sample: Ambient Background Data file: 1SterQ2017-Amb.CHR (c:\peak359) Sample: Ambient Background Operator: D. Kremer Operator: D. Kremer -1.600 16.000 -6.400 64.000 Dead Vol / Air 0.0000/ 1.9370/0.233 0.0000/ Dead Vol / Air 0.2580/0.350 0.0000/ 144.7770/0.350 0.0000/ Ambient H2O Component Area Retention External Units Component Retention Area External Units 0.233 0.0000 Dead Vol / Air Dead Vol / Air 1.9370 0.166 16.8890 0.0000

Ambient H2O

Client: Sterigenics - Queensbury

Column: 1% SP-1000, Carbopack B

0.350

144.7770

161.6660

0.0000

0.0000

Client ID: PreCal Analysis date: 10/23/2017 12:41:24

Carrier: HELIUM

Temp. prog: eto-100.tem Components: eto2-100.cpt

Method: Direct Injection
Description: CHANNEL 2 - PID

LOD HORNE. LUCI

Client ID: PreCal

Analysis date: 10/23/2017 12:41:24 Method: Direct Injection

Description: CHANNEL 1 - FID

Carrier: HELIUM

Temp. prog: eto-100.tem

Components: eto1-100.cpt

Ambient H2O

Client: Sterigenics - Queensbury

Column: 1% SP-1000, Carbopack B

0.350

0.2580

2.1950

0.0000

0.0000

Data file: 2SterQ2017-C01.CHR (c:\peak359) Sample: 100 ppm EtO std Data file: 1SterQ2017-C01.CHR (c:\peak359) Sample: 100 ppm EtO std Operator: D. Kremer Operator: D. Kremer 64,000 -51.200 512.000 0.3270/0.066 Dead Vol / Air 0.00000 Dead Vol / Air 3.6660/0.233 0.0000/ Ethylene Oxide mqq/00000.0 0.1470/0.716 0.0000/ unknown CO2 0.0790/0.800 0.1325/0.833 0.0000/ Component Retention Area External Units Component Retention External Units Area Dead Vol / Air 0.066 0.0000 0.3270 Dead Vol / Air 0.233 3.6660 0.0000 0.0000 ppm Ethylene Oxide 0.466 43.2250 0.0000 ppm Ethylene Oxide 0.466 220.9660 Acetaldehyde 0.0000 0.716 0.1470

CO2

0.0000

43.5520

Lad Hairie. Loci

Client ID: PreCal

Analysis date: 10/23/2017 12:44:49

Method: Direct Injection

Description: CHANNEL 2 - PID

Carrier: HELIUM

Temp. prog: eto-100.tem Components: eto2-100.cpt

Client: Sterigenics - Queensbury

Column: 1% SP-1000, Carbopack B

0.833

0.1325

224.9115

0.0000

0.0000

o name. Loo

Client ID: PreCal

Analysis date: 10/23/2017 12:44:49

Method: Direct Injection

Description: CHANNEL 1 - FID

Carrier: HELIUM

Temp. prog: eto-100.tem

Components: eto1-100 cpt

Client: Sterigenics - Queensbury

Column: 1% SP-1000, Carbopack B

Components: eto2-100.cpt Components: eto1-100.cpt Data file: 2SterQ2017-C02.CHR (c:\peak359) Data file: 1SterQ2017-C02.CHR (c:\peak359) Sample: 100 ppm EtO std Sample: 100 ppm EtO std Operator: D. Kremer Operator: D. Kremer -6.400 64,000 -51,200 512,000 50.0000/Units -0.0210/0.000 0.2580/0.083 Dead Vol / Alir 0.2175/0.133 0.0000/ 221.4190/0.483 0.0000/ppm 0.1530/0.733 0.0000/ 0.0000/ CO2 External Units External Units Component Retention Area Component Retention Area Dead Vol / Air 0.083 0.2580 0.0000 Dead Vol / Air 0.0000 0.133 0.2175 Ethylene Oxide 0.483 42.0340 0.0000 ppm Ethylene Oxide 0.483 221.4190 0.0000 ppm

Acetaldehyde

CO2

Client: Sterigenics - Queensbury

Column: 1% SP-1000, Carbopack B

0.733

0.866

0.0000

0.0000

0.0000

0.1530

0.2450

222.0345

Client ID: PreCal

Analysis date: 10/23/2017 12:53:02

Method: Direct Injection

Description: CHANNEL 2 - PID

Carrier: HELIUM

Temp. prog: eto-100.tem

Client: Sterigenics - Queensbury

Column: 1% SP-1000, Carbopack B

42.2920

0.0000

Client ID: PreCal

Analysis date: 10/23/2017 12:53:02

Method: Direct Injection

Description: CHANNEL 1 - FID

Carrier: HELIUM

Components: eto1-100.cpt Components: eto2-100.cpt Data file: 1SterQ2017-C03.CHR (c:\peak359)
Sample: 10.1 ppm EtO std Data file: 2SterQ2017-C03.CHR (c:\peak359) Sample: 10.1 ppm EtO std Operator: D. Kremer Operator: D. Kremer 128.000 External/Units 16,000 -12.800 -1.600 0.2380/0.083 0.0000/ Dead Vol / Air Dead Vol / Air Ambient H2O 1 6980/0 283 0.0090/0.316 0.0000/ 23,2650/0.466 0.0000/ppr 0.1300/0.550 0.0000/ 0.2260/0.733 0.0000/ CO2 0.1160/0.900 0.0000/ Component Retention External Units Component Retention Агеа External Units Area 0.083 0.2380 0.0000 Dead Vol / Air 0.283 1.6980 0.0000 Dead Vol / Air Ethylene Oxide 0.483 4.2500 0.0000 ppm Ambient H2O 0.316 0.0090 0.0000 0.0000 ppm Ethylene Oxide 23.2650 0.466

Acetaldehyde

CO2

Client: Sterigenics - Queensbury

Column: 1% SP-1000, Carbopack B

0.733

0.900

0.2260

0.1160

25.3140

0.0000

0.0000

0.0000

Client ID: PreCal

Analysis date: 10/23/2017 12:59:08

Method: Direct Injection

Description: CHANNEL 2 - PID

Carrier: HELIUM

Temp. prog: eto-100.tem

Client: Sterigenics - Queensbury

Column: 1% SP-1000, Carbopack B

4.4880

0.0000

Client ID: PreCal

Analysis date: 10/23/2017 12:59:08

Method: Direct Injection

Description: CHANNEL 1 - FID

Carrier: HELIUM

Components: eto1-100.cpt Components: eto2-100.cpt Data file: 1SterQ2017-C04.CHR (c:\peak359) Data file: 2SterQ2017-C04.CHR (c:\peak359) Sample: 10.1 ppm EtO std Sample: 10.1 ppm EtO std Operator: D. Kremer Operator: D. Kremer 128.000 External/Unit -12.800 -1.600 0.4320/0.083 Dead Vol / Air 9.9345/0.150 0.0000/ Dead Vol / Air Ethylene Oxide 24 2020AD 483 0.0000/00 0.1500/0.550 unknown 0.0000/ 0.3240/0.683 0.0000/ 0.1850/0.750 n nnnn CO2 0.1420/0.866 0.0000.0 External Units External Units Component Retention Area Component Retention Area 0.0000 Dead Vol / Air 0.083 0.4320 Dead Vol / Air 0.150 9.9345 0.0000 0.483 4.3340 0.0000 ppm 0.0000 ppm Ethylene Oxide Ethylene Oxide 0.483 24.2020

Acetaldehyde

CO2

Client: Sterigenics - Queensbury

Column: 1% SP-1000, Carbopack B

0.750

0.1850

4.9510

0.0000

0.0000

Client ID: PreCal

Analysis date: 10/23/2017 13:03:06

Method: Direct Injection

Description: CHANNEL 1 - FID

Carrier: HELIUM

Temp. prog: eto-100.tem

Acetaldehyde

Client: Sterigenics - Queensbury

Column: 1% SP-1000, Carbopack B

0.683

0.866

0.3240

0.1420

34.6025

0.0000

0.0000

0.0000

Client ID: PreCal

Analysis date: 10/23/2017 13:03:06

Method: Direct Injection

Description: CHANNEL 2 - PID

Carrier: HELIUM

Components: eto2-100.cpt Components: eto1-100.cpt Data file: 1SterQ2017-C05.CHR (c:\peak359) Data file: 2SterQ2017-C05.CHR (c:\peak359) Sample: 1.10 ppm EtO std Sample: 1.10 ppm EtO std Operator: D. Kremer Operator: D. Kremer -0.400 4.000 -12.800 128.000 0.2080/0.083 3.0000/ Dead Vol / Air 22.5200/0.183 Dead Vol / Air 0.0000/ Ethylene Oxide 0.4590/0.466 0.00004ppm Ethylene Oxide 2 6460/0.466 0.0000*t*ppr Acetaldehyde 0.1220/0.700 0.0000/ 0.2475/0.883 0.0000/ External Units External Units Component Retention Area Component Retention Area Dead Vol / Air 0.083 0.2080 0.0000 Dead Vol / Air 0.183 22.5200 0.0000 0.0000 ppm 0.466 0.4590 0.0000 ppm Ethylene Oxide 0.466 2.6460 Ethylene Oxide

Acetaldehyde

CO2

Client: Sterigenics - Queensbury

Column: 1% SP-1000, Carbopack B

0.700

0.883

0.1220

0.2475

25.5355

0.0000

0.0000

0.0000

Client ID: PreCal

Analysis date: 10/23/2017 13:08:33

Method: Direct Injection

Description: CHANNEL 2 - PID

Carrier: HELIUM

Temp. prog: eto-100.tem

Client: Sterigenics - Queensbury

Column: 1% SP-1000, Carbopack B

0.6670

0.0000

Client ID: PreCal

Analysis date: 10/23/2017 13:08:33

Method: Direct Injection

Description: CHANNEL 1 - FID

Carrier: HELIUM

Components: eto1-100.cpt Components: eto2-100.cpt Data file: 2SterQ2017-C06.CHR (c:\peak359) Data file: 1SterQ2017-C06.CHR (c:\peak359) Sample: 1.10 ppm EtO std Sample: 1.10 ppm EtO std Operator: D. Kremer Operator: D. Kremer 4.000 -12.800 128.000 0.2100/0.066 Dead Vol / Air Dead Vol / Air 1.8330/0.216 o onno/ 0.0000/ CO2 0.2385/0.950 Retention External Units Component Retention External Units Component Area Area 0.066 0.2100 0.0000 Dead Vol / Air 0.216 1.8330 0.0000 Dead Vol / Air

Ethylene Oxide

Acetaldehyde

CO2

Client: Sterigenics - Queensbury

Column: 1% SP-1000, Carbopack B

2.5890

0.0905

0.2385

4.7510

0.466

0.583

0.950

0.0000 ppm

0.0000

0.0000

0.0000

Client ID: PreCal

Carrier: HELIUM

Temp. prog: eto-100.tem

Analysis date: 10/23/2017 13:11:25

Method: Direct Injection
Description: CHANNEL 2 - PID

Client: Sterigenics - Queensbury

Column: 1% SP-1000, Carbopack B

0.466

0.4415

0.6515

0.0000 ppm

0.0000

Client ID: PreCal

Analysis date: 10/23/2017 13:11:25

Method: Direct Injection

Description: CHANNEL 1 - FID

Carrier: HELIUM

Temp. prog: eto-100.tem

Ethylene Oxide

Data file: 1SterQ2017-C07.CHR (c:\peak359) Data file: 2SterQ2017-C07.CHR (c:\peak359) Sample: 48.8 ppm EtO std Operator: D. Kremer Sample: 48.8 ppm EtO std Operator: D. Kremer -12.800 128.000 -51.200 512.000 0.4135/0.083 Dead Vol / Air 0.0000 5.7840/0.116 Dead Vol / Air 0.0000/ 20 9545/0 466 111.8110/0.466 1.1930/0.550 0.0000/ 0.0000/ CO2 0.1525/0.866 0.00007 Component Retention Area External Units Component Retention Area External Units Dead Vol / Air 0.083 0.4135 0.0000 Dead Vol / Air 0.116 5.7840 0.0000 Ethylene Oxide 0.466 20.9545 49.8619 ppm Ethylene Oxide 0.466 111.8110 48.2759 ppm

Acetaldehyde

CO2

たない ロロコロ・ たくくに

Client ID: PreCal

Analysis date: 10/23/2017 13:18:17

Method: Direct Injection

Description: CHANNEL 2 - PID

Carrier: HELIUM

Temp. prog: eto-100.tem

Components: eto2-100.cpt

Client: Sterigenics - Queensbury

Column: 1% SP-1000, Carbopack B

0.666

0.866

0.2680

0.1525

118.0155 48.2759

0.0000

0.0000

Lab Haille. LCOI

Client ID: PreCal

Analysis date: 10/23/2017 13:18:17

Method: Direct Injection

Description: CHANNEL 1 - FID

Carrier: HELIUM

Temp. prog: eto-100.tem

Components: eto1-100.cpt

Client: Sterigenics - Queensbury

Column: 1% SP-1000, Carbopack B

21.3680

49.8619

Temp. prog: eto-100.tem Components: eto2-100.cpt Components: eto1-100.cpt Data file: 2SterQ2017-C08.CHR (c:\peak359) Sample: 48.8 ppm EtO std Data file: 1SterQ2017-C08.CHR (c:\peak359) Sample: 48.8 ppm EtO std Operator: D. Kremer Operator: D. Kremer -12\_800 128.000 -3.200 32.000 Dead Vol / Air 0.2480/0.083 .4930/0.116 0.0000/ Dead Vol / Air 49,1016/ppm 49.2789/ppm 0.1270/0.733 0.0000/ CO2 .0000/ Component Retention Area External Units Component Retention Area External Units 0.083 0.2480 0.0000 Dead Vol / Air 0.116 1.4930 0.0000 Dead Vol / Air

Ethylene Oxide

Acetaldehyde

CO2

49.1016 ppm

49.1016

Lab Haine, Loui

Client ID: MidCal

Analysis date: 10/24/2017 08:30:40

Method: Direct Injection

Description: CHANNEL 2 - PID

Carrier: HELIUM

Client: Sterigenics - Queensbury

Column: 1% SP-1000, Carbopack B

0.483

0.733

0.833

114.1340

115.8490

0.1270

0.0950

49.2789 ppm

0.0000

0.0000

49.2789

Lab Haille. LUOI

Client ID: MidCal

Carrier: HELIUM

Temp. prog: eto-100.tem

Analysis date: 10/24/2017 08:30:40

Method: Direct Injection

Client: Sterigenics - Queensbury

Description: CHANNEL 1 - FID Column: 1% SP-1000, Carbopack B

0.483

Ethylene Oxide

20.6350

20.8830

Lab flaffie. LCOI Client: Sterigenics - Queensbury Client ID: PostCal

Analysis date: 10/24/2017 13:45:53 Method: Direct Injection Description: CHANNEL 1 - FID

Column: 1% SP-1000, Carbopack B Carrier: HELIUM

Temp. prog: eto-100.tem Components: eto1-100.cpt

Data file: 1SterQ2017-C09.CHR (c:\peak359)

Sample: 48.8 ppm EtO std

0.483

20.6810

20.8930

49.2111 ppm

49.2111

Operator: D. Kremer

Ethylene Oxide

Client: Sterigenics - Queensbury Client ID: PostCal

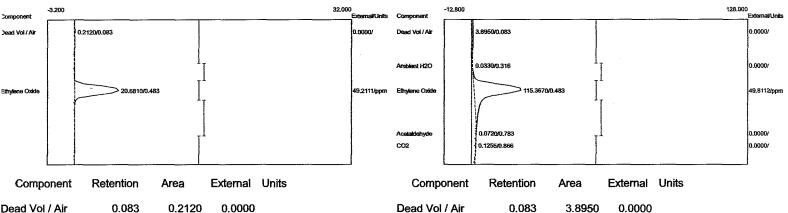
Analysis date: 10/24/2017 13:45:53 Method: Direct Injection Description: CHANNEL 2 - PID

Column: 1% SP-1000, Carbopack B Carrier: HELIUM

Temp. prog: eto-100.tem Components: eto2-100.cpt

Data file: 2SterQ2017-C09.CHR (c:\peak359) Sample: 48.8 ppm EtO std

Operator: D. Kremer



Dead Vol / Air 0.083 3.8950 0.0000 Ambient H2O 0.316 0.0330 0.0000 Ethylene Oxide 115.3670 0.483 49.8112 ppm Acetaldehyde 0.783 0.0720 0.0000 CO2 0.866 0.1255 0.0000

> 119.4925 49.8112

## **APPENDIX B**

Run #1 Chromatograms – Backvent



Components: eto1-100.cpt
Data file: 1SterQ2017-1B01.CHR (c:\peak359) Data file: 2SterQ2017-1B01.CHR (c:\peak359) Sample: Abator Inlet Sample: Abator Outlet Operator: D. Kremer Operator: D. Kremer 64.000 External/Units -12.800 128.000 -6.400 15.7820/0.100 Dead Voi / Air 00000 1.7425/0.233 0.0000/ 91.1300/0.483 External Units Component Retention Area Component Retention External Units Агеа 0.233 1.7425 0.0000 Dead Vol / Air 0.0000 Dead Vol / Air 0.100 15.7820

Ambient H2O

Client: Sterigenics - Queensbury

Column: 1% SP-1000, Carbopack B

0.366

108.8840

124.6660

0.0000

0.0000

Client ID: Run#1BV

Carrier: HELIUM

Temp. prog: eto-100.tem

Components: eto2-100.cpt

Analysis date: 10/24/2017 10:10:02 Method: Direct Injection

Description: CHANNEL 2 - PID

Client: Sterigenics - Queensbury

Column: 1% SP-1000, Carbopack B

0.483

91.1300 216.8467 ppm

92.8725 216.8467

Client ID: Run#1BV

Carrier: HELIUM

Temp. prog: eto-100.tem

Ethylene Oxide

Analysis date: 10/24/2017 10:10:02 Method: Direct Injection

Data file: 2SterQ2017-1B02.CHR (c:\peak359) Data file: 1SterQ2017-1B02.CHR (c:\peak359) Sample: Abator Inlet Sample: Abator Outlet Operator: D. Kremer Operator: D. Kremer 64.000 External/Units 64.000 -6.400 -6.400 0.0000/ ead Vol / Air 1.7905/0.216 n nonn External Units Component Retention Component Retention Area External Units Dead Vol / Air 0.216 1.7905 0.0000 Dead Vol / Air 0.083 20.3650 0.0000

Ambient H2O

78.9362 ppm

Client: Sterigenics - Queensbury

Column: 1% SP-1000, Carbopack B

0.350

109.1170

129.4820

0.0000

0.0000

Client ID: Run#1BV

Carrier: HELIUM Temp. prog: eto-100.tem Components: eto2-100.cpt

Analysis date: 10/24/2017 10:11:09

Method: Direct Injection

Description: CHANNEL 2 - PID

Client: Sterigenics - Queensbury

Column: 1% SP-1000, Carbopack B

0.466

33.1730

34.9635 78.9362

Client ID: Run#1BV

Carrier: HELIUM

Temp. prog: eto-100.tem Components: eto1-100.cpt

Ethylene Oxide

Analysis date: 10/24/2017 10:11:09 Method: Direct Injection

Data file: 2SterQ2017-1B03.CHR (c:\peak359) Data file: 1SterQ2017-1B03.CHR (c:\peak359) Sample: Abator Outlet Sample: Abator Inlet Operator: D. Kremer Operator: D. Kremer 64,000 -6,400 64.000 -6.400 Component 19.2010/0.066 0.0000/ Dead Vol / Air 1.7730/0.216 \0000.0 51.5216/ppm Retention External Units Component Retention Area External Units Component Area

Dead Vol / Air

Ambient H2O

Client: Sterigenics - Queensbury

Column: 1% SP-1000, Carbopack B

0.066

0.366

0.0000

0.0000

0.0000

19.2010

107.4850

126.6860

Client ID: Run#1BV

Carrier: HELIUM

Temp. prog: eto-100.tem Components: eto2-100.cpt

Analysis date: 10/24/2017 10:12:34

Method: Direct Injection

Description: CHANNEL 2 - PID

Client: Sterigenics - Queensbury

Column: 1% SP-1000, Carbopack B

0.216

0.483

0.0000

51.5216 ppm

1.7730

23.4250 51.5216

21.6520

Client ID: Run#1BV

Carrier: HELIUM

Temp. prog: eto-100.tem

Components: eto1-100.cpt

Dead Vol / Air

Ethylene Oxide

Analysis date: 10/24/2017 10:12:34

Method: Direct Injection

Temp. prog: eto-100.tem Components: eto2-100.cpt Temp. prog: eto-100.tem Components: eto1-100.cpt Data file: 1SterQ2017-1B04.CHR (c:\peak359) Data file: 2SterQ2017-1B04.CHR (c:\peak359) Sample: Abator Inlet Sample: Abator Outlet Operator: D. Kremer Operator: D. Kremer -3.200 32.000 -6.400 64.000 Evtomol/Units 0.0000/ 1.7810/0.216 19 6650/0 483 Component Retention External Units Component Retention External Units Area Area 0.216 0.0000 Dead Vol / Air 1.7810 Ambient H2O 0.366 104.6830 0.0000 Ethylene Oxide 0.483 19.6650 46.7935 ppm

Client: Sterigenics - Queensbury

Column: 1% SP-1000, Carbopack B

104.6830

0.0000

Client ID: Run#1BV

Carrier: HELIUM

Analysis date: 10/24/2017 10:13:39 Method: Direct Injection

Description: CHANNEL 2 - PID

Client: Sterigenics - Queensbury

Column: 1% SP-1000, Carbopack B

21.4460

46.7935

Client ID: Run#1BV

Carrier: HELIUM

Analysis date: 10/24/2017 10:13:39 Method: Direct Injection

Data file: 1SterQ2017-1B05.CHR (c:\peak359) Sample: Abator Inlet Data file: 2SterQ2017-1B05.CHR (c:\peak359) Sample: Abator Outlet Operator: D. Kremer Operator: D. Kremer 32,000 -6.400 64.000 -3.200 20.1190/0.083 0.0000/ 1.7895/0.216 ร กกกก/ 18.3340/0.466 13.6263/ppm Component Retention Area External Units Component Retention Area External Units

Dead Vol / Air

Ambient H2O

Client: Sterigenics - Queensbury

Column: 1% SP-1000, Carbopack B

0.083

0.366

20.1190

106.0440

126.1630

0.0000

0.0000

0.0000

Client ID: Run#1BV Analysis date: 10/24/2017 10:14:46

Carrier: HELIUM

Temp. prog: eto-100.tem Components: eto2-100.cpt

Method: Direct Injection
Description: CHANNEL 2 - PID

Lab name.

Dead Vol / Air

Ethylene Oxide

Client ID: Run#1BV

Carrier: HELIUM Temp. prog: eto-100.tem

Components: eto1-100.cpt

Analysis date: 10/24/2017 10:14:46 Method: Direct Injection Description: CHANNEL 1 - FID

Client: Sterigenics - Queensbury

Column: 1% SP-1000, Carbopack B

0.216

0.466

1.7895

18.3340

20.1235 43.6263

0.0000

43.6263 ppm

Components: eto1-100.cpt Data file: 2SterQ2017-1B06.CHR (c:\peak359) Data file: 1SterQ2017-1B06.CHR (c:\peak359) Sample: Abator Inlet Sample: Abator Outlet Operator: D. Kremer Operator: D. Kremer -3.200 32,000 64.000 Component Dead Vol / Air 21.5530/0.033 0.0000/ 1.7985/0.233 ead Vot/Air Ambient H2O 17.3435/0.483 External Units Component Retention Component Retention External Units Area Area 0.233 1.7985 0.0000 Dead Vol / Air Dead Vol / Air 0.033 21.5530 0.0000

Ambient H2O

Client: Sterigenics - Queensbury

Column: 1% SP-1000, Carbopack B

0.366

103.9980

125.5510

0.0000

0.0000

Client ID: Run#1BV

Carrier: HELIUM

Temp. prog: eto-100.tem

Components: eto2-100.cpt

Analysis date: 10/24/2017 10:15:52

Method: Direct Injection

Description: CHANNEL 2 - PID

Client: Sterigenics - Queensbury

Column: 1% SP-1000, Carbopack B

0.483

17.3435

19.1420 41.2694

41.2694 ppm

Client ID: Run#1BV

Carrier: HELIUM

Temp. prog: eto-100.tem

Ethylene Oxide

Analysis date: 10/24/2017 10:15:52

Method: Direct Injection

Components: eto2-100.cpt Components: eto1-100.cpt Data file: 1SterQ2017-1B07.CHR (c:\peak359)
Sample: Abator Inlet Data file: 2SterQ2017-1B07.CHR (c:\peak359) Sample: Abator Outlet Operator: D. Kremer Operator: D. Kremer -3,200 32.000 64.000 16.6340/0.066 0.0000/ Dead Vol / Air ead Vol / Air 1.8190/0.216 n naan 16.7390/0.466 39.8310/ppm Component Retention External Units Retention External Units Area Component Area

Dead Vol / Air

Ambient H2O

Client: Sterigenics - Queensbury

Column: 1% SP-1000, Carbopack B

0.066

0.366

0.0000

0.0000

0.0000

16.6340

102.4705

119.1045

Client ID: Run#1BV

Carrier: HELIUM

Temp. prog: eto-100.tem

Analysis date: 10/24/2017 10:17:22

Method: Direct Injection

Description: CHANNEL 2 - PID

Client: Sterigenics - Queensbury

Column: 1% SP-1000, Carbopack B

0.216

0.466

1.8190

16.7390

18.5580

0.0000

39.8310

39.8310 ppm

Client ID: Run#1BV

Carrier: HELIUM

Temp. prog: eto-100.tem

Dead Vol / Air

Ethylene Oxide

Analysis date: 10/24/2017 10:17:22

Method: Direct Injection

Data file: 1SterQ2017-1B08.CHR (c:\peak359) Data file: 2SterQ2017-1B08.CHR (c:\peak359) Sample: Abator Outlet Sample: Abator Inlet Operator: D. Kremer Operator: D. Kremer -3.200 32.000 -6.400 64.000 18.3310/0.100 0.0000/ 1.8305/0.216 0.0000/ ead Vol/Air 103,6890/0,366 Ambient H2O .0000/ 15.9180/0.483 37.8774/ppm Component Retention External Units Component Retention External Units Area Area 0.216 0.0000 Dead Vol / Air 0.100 0.0000 Dead Vol / Air 1.8305 18.3310

Ambient H2O

Lab Harrie, Low

Client ID: Run#1BV

Carrier: HELIUM

Temp. prog: eto-100.tem Components: eto2-100.cpt

Analysis date: 10/24/2017 10:18:32

Method: Direct Injection

Description: CHANNEL 2 - PID

Client: Sterigenics - Queensbury

Column: 1% SP-1000, Carbopack B

103.6890

122.0200

0.366

0.0000

0.0000

Lab Haille. Looi

Client ID: Run#1BV

Carrier: HELIUM

Temp. prog: eto-100.tem

Components: eto1-100.cpt

Ethylene Oxide

Analysis date: 10/24/2017 10:18:32

Method: Direct Injection

Description: CHANNEL 1 - FID

Client: Sterigenics - Queensbury

Column: 1% SP-1000, Carbopack B

15.9180

17.7485

37.8774 ppm

37.8774

Data file: 1SterQ2017-1B09.CHR (c:\peak359) Data file: 2SterQ2017-1B09.CHR (c:\peak359) Sample: Abator Outlet Sample: Abator Inlet Operator: D. Kremer Operator: D. Kremer 32.000 -6.400 -3.200 64.000 17.6620/0.100 0.0000/ 1.8845/0.233 lead Vol / Air 0.0000/ Ambient H2O 101.1570/0.366 0.0000/ Component Retention Area **External Units** Component Retention Area External Units Dead Vol / Air 0.233 1.8845 0.0000 Dead Vol / Air 0.100 17.6620 0.0000

Ambient H2O

Lau Haille. Look

Client ID: Run#1BV

Temp. prog: eto-100.tem Components: eto2-100.cpt

Analysis date: 10/24/2017 10:19:40

Method: Direct Injection
Description: CHANNEL 2 - PID

Client: Sterigenics - Queensbury

Column: 1% SP-1000, Carbopack B Carrier: HELIUM

0.366

101.1570

118.8190

0.0000

0.0000

Lay Haille. Look

Client ID: Run#1BV

Temp. prog: eto-100.tem

Components: eto1-100.cpt

Ethylene Oxide

Analysis date: 10/24/2017 10:19:40

Method: Direct Injection

Description: CHANNEL 1 - FID

Client: Sterigenics - Queensbury

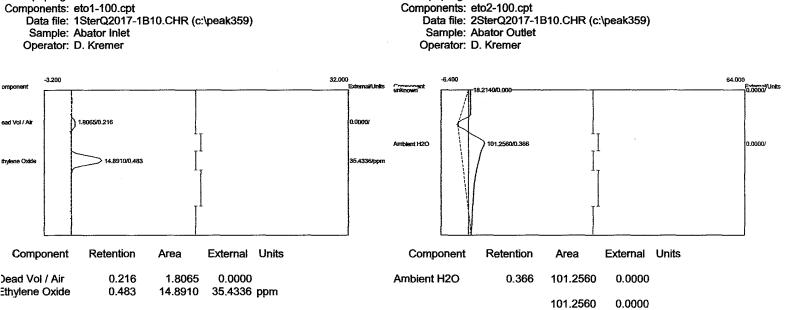
Column: 1% SP-1000, Carbopack B Carrier: HELIUM

0.483

15.5240

17.4085

36.9398 ppm



Client: Sterigenics - Queensbury

Column: 1% SP-1000, Carbopack B

Client ID: Run#1BV

Carrier: HELIUM

Temp. prog: eto-100.tem

Analysis date: 10/24/2017 10:20:49

Method: Direct Injection
Description: CHANNEL 2 - PID

Client: Sterigenics - Queensbury

Column: 1% SP-1000, Carbopack B

16.6975 35.4336

Client ID: Run#1BV

Carrier: HELIUM

Temp. prog: eto-100.tem

Analysis date: 10/24/2017 10:20:49

Method: Direct Injection
Description: CHANNEL 1 - FID

Components: eto1-100.cpt Components: eto2-100.cpt Data file: 2SterQ2017-1B11.CHR (c:\peak359) Data file: 1SterQ2017-1B11.CHR (c:\peak359) Sample: Abator Inlet Sample: Abator Outlet Operator: D. Kremer Operator: D. Kremer -3.200 32.000 64.000 15.7020/0,066 Dead Voi / Air 0.0000/ ead Vol / Air 1.8070/0.216 0.00007 nbient H2O 102.9150/0.366 0.0000/ 12.6315/0.483 30.0570/ppm External Units Component Retention Area Component Retention External Units Area

Dead Vol / Air

Ambient H2O

Client: Sterigenics - Queensbury

Column: 1% SP-1000, Carbopack B

0.066

0.366

15.7020

102.9150

118.6170

0.0000

0.0000

0.0000

Client ID: Run#1BV

Carrier: HELIUM Temp. prog: eto-100.tem

Analysis date: 10/24/2017 10:22:28

Method: Direct Injection

Description: CHANNEL 2 - PID

Client: Sterigenics - Queensbury

Column: 1% SP-1000, Carbopack B

0.216

0.483

1.8070

12.6315

14.4385

0.0000

30.0570

30.0570 ppm

Client ID: Run#1BV

Carrier: HELIUM

Temp. prog: eto-100.tem

Dead Vol / Air

Ethylene Oxide

Analysis date: 10/24/2017 10:22:28

Method: Direct Injection

Components: eto1-100.cpt Components: eto2-100.cpt Data file: 1SterQ2017-1B12.CHR (c:\peak359) Data file: 2SterQ2017-1B12.CHR (c:\peak359) Sample: Abator Inlet Sample: Abator Outlet Operator: D. Kremer Operator: D. Kremer 64.000 External/Units -1.600 16.000 -6.400 17.6000/0.083 0.0000/ 1.8160/0.216 lead Vol / Air 0.0000/ 101.1250/0.366 0.0000/ 8.3735/0.483 19.9250/ppm Retention External Units Component Retention External Units Component Area Area Dead Vol / Air 0.216 0.0000 Dead Vol / Air 0.083 17.6000 0.0000 1.8160

Ambient H2O

Client: Sterigenics - Queensbury

Column: 1% SP-1000, Carbopack B

0.366

101.1250

118.7250

0.0000

0.0000

Client ID: Run#1BV

Carrier: HELIUM

Temp. prog: eto-100.tem

Analysis date: 10/24/2017 10:23:39

Method: Direct Injection

Description: CHANNEL 2 - PID

Client: Sterigenics - Queensbury

Column: 1% SP-1000, Carbopack B

0.483

8.3735

10.1895

19.9250 ppm

19.9250

Client ID: Run#1BV

Carrier: HELIUM

Temp. prog: eto-100.tem

Ethylene Oxide

Analysis date: 10/24/2017 10:23:39

Method: Direct Injection

## **APPENDIX C**

Run #1 Chromatograms – Aeration



Data file: 1SterQ2017-1A01.CHR (c:\peak359) Data file: 2SterQ2017-1A01.CHR (c:\peak359) Sample: Abator Outlet Sample: Abator Inlet Operator: D. Kremer Operator: D. Kremer -1.600 16.000 -3.200 32.000 14.3810/0.116 1.7795/0.216 104.9075/0.350 0.0000/ Ambient H2O thylene Oxide Component Retention Area External Units Component Retention External Units Area

Dead Vol / Air

Ambient H2O

Client: Sterigenics - Queensbury

Column: 1% SP-1000, Carbopack B

0.116

0.350

14.3810

104.9075

119.2885

0.0000

0.0000

0.0000

Client ID: Run#1Aer Analysis date: 10/24/2017 08:47:07

Carrier: HELIUM Temp. prog: eto-100.tem Components: eto2-100.cpt

Method: Direct Injection
Description: CHANNEL 2 - PID

Lav Haine.

Dead Vol / Air

Ethylene Oxide

Client ID: Run#1Aer

Carrier: HELIUM

Temp. prog: eto-100.tem Components: eto1-100.cpt

Analysis date: 10/24/2017 08:47:07 Method: Direct Injection

Description: CHANNEL 1 - FID

Client: Sterigenics - Queensbury

Column: 1% SP-1000, Carbopack B

0.216

0.466

1.7795

2.2065

3.9860

0.0000

5.2504

5.2504 ppm

Temp. prog: eto-100.tem Components: eto2-100.cpt Data file: 2SterQ2017-1A02.CHR (c:\peak359) Data file: 1SterQ2017-1A02.CHR (c:\peak359) Sample: Abator Inlet Sample: Abator Outlet Operator: D. Kremer Operator: D. Kremer -1.600 16.000 -3.200 32.000 Dead Vol / Air 15.1460/0.100 0.0000/ ead Vol / Air 1.7930/0.216 0.0000 103,7525/0.350 2,3315/0.483 5.5479/ррп Retention External Units Component Area Component Retention Area External Units

Dead Vol / Air

Ambient H2O

Client: Sterigenics - Queensbury

Column: 1% SP-1000, Carbopack B

0.100

0.350

15.1460

103.7525

118.8985

0.0000

0.0000

0.0000

Client ID: Run#1Aer

Carrier: HELIUM

Analysis date: 10/24/2017 08:52:19 Method: Direct Injection
Description: CHANNEL 2 - PID

Client: Sterigenics - Queensbury

Column: 1% SP-1000, Carbopack B

0.216

0.483

1.7930

2.3315

4.1245

0.0000

5.5479

5.5479 ppm

Client ID: Run#1Aer

Carrier: HELIUM

Temp. prog: eto-100.tem Components: eto1-100.cpt

Dead Vol / Air

Ethylene Oxide

Analysis date: 10/24/2017 08:52:19

Method: Direct Injection Description: CHANNEL 1 - FID

Components: eto2-100.cpt Components: eto1-100.cpt Data file: 2SterQ2017-1A03.CHR (c:\peak359) Data file: 1SterQ2017-1A03.CHR (c:\peak359) Sample: Abator Inlet Sample: Abator Outlet Operator: D. Kremer Operator: D. Kremer 16.000 -3.200 32.000 -1.600 15.3310/0.083 0.0000/ Dead Vol / Air ead Vol / Air 0.0000/ Ambient H2O 102.9290/0.350 thylene Oxide External Units Component Retention Area External Units Component Retention Area

Dead Vol / Air

Ambient H2O

Client: Sterigenics - Queensbury

Column: 1% SP-1000, Carbopack B

0.083

0.350

15.3310

102.9290

118.2600

0.0000

0.0000

0.0000

Client ID: Run#1Aer

Carrier: HELIUM

Temp. prog: eto-100.tem

Analysis date: 10/24/2017 08:57:04

Method: Direct Injection
Description: CHANNEL 2 - PID

Lad Haille. Looi

Client ID: Run#1Aer

Carrier: HELIUM

Temp. prog: eto-100.tem

Dead Vol / Air

Ethylene Oxide

Analysis date: 10/24/2017 08:57:04

Method: Direct Injection

Description: CHANNEL 1 - FID

Client: Sterigenics - Queensbury

Column: 1% SP-1000, Carbopack B

0.216

0.483

0.0000

5.2968

5.2968 ppm

1.8055

2.2260

Carrier: HELIUM Carrier: HELIUM Temp. prog: eto-100.tem Temp. prog: eto-100.tem Components: eto1-100.cpt Components: eto2-100.cpt Data file: 1SterQ2017-1A04.CHR (c:\peak359)
Sample: Abator Inlet
Operator: D. Kremer Data file: 2SterQ2017-1A04.CHR (c:\peak359)
Sample: Abator Outlet Operator: D. Kremer -1.600 16.000 -3.200 32,000 17.3885/0.100 0.0000/ 1.8085/0.233 ead Vot / Air 0.0000/ 2.1210/0.483 5.0470/ppm

Component

Dead Vol / Air

Ambient H2O

External Units

5.0470 ppm

0.0000

5.0470

Client: Sterigenics - Queensbury

Column: 1% SP-1000, Carbopack B

Retention

0.100

0.366

Area

17.3885

101.1420

118.5305

External Units

0.0000

0.0000

0.0000

Client ID: Run#1Aer Analysis date: 10/24/2017 09:02:10

Method: Direct Injection
Description: CHANNEL 2 - PID

Client: Sterigenics - Queensbury

Column: 1% SP-1000, Carbopack B

Retention

0.233

0.483

Area

1.8085

2.1210

3.9295

Client ID: Run#1Aer

Component

Dead Vol / Air

Ethylene Oxide

Analysis date: 10/24/2017 09:02:10

Method: Direct Injection
Description: CHANNEL 1 - FID

Components: eto1-100.cpt Components: eto2-100.cpt Data file: 2SterQ2017-1A05.CHR (c:\peak359) Sample: Abator Outlet Data file: 1SterQ2017-1A05.CHR (c:\peak359) Sample: Abator Inlet Operator: D. Kremer Operator: D. Kremer -3.200 32.000 -1.600 16.000 5.9360/0.116 /0000.0 1.7930/0.233 0.0000/ ead Vol / Air 2.1460/0.483 i.1065/ppm Component Retention Area External Units Component Retention Area External Units

Dead Vol / Air

Ambient H2O

Client: Sterigenics - Queensbury

Column: 1% SP-1000, Carbopack B

0.233

0.483

Dead Vol / Air

Ethylene Oxide

0.0000

5.1065

5.1065 ppm

1.7930

2.1460

3.9390

Client ID: Run#1Aer

Carrier: HELIUM

Temp. prog: eto-100.tem

Analysis date: 10/24/2017 09:07:03

Method: Direct Injection

Description: CHANNEL 1 - FID

Client: Sterigenics - Queensbury

Column: 1% SP-1000, Carbopack B

15.9360

100.9190

116.8550

0.116

0.366

0.0000

0.0000

0.0000

Client ID: Run#1Aer

Carrier: HELIUM

Temp. prog: eto-100.tem

Analysis date: 10/24/2017 09:07:03

Method: Direct Injection

Description: CHANNÉL 2 - PID Description: CHANNEL 1 - FID Column: 1% SP-1000, Carbopack B Column: 1% SP-1000, Carbopack B Carrier: HELIUM Carrier: HELIUM Temp. prog: eto-100.tem Temp. prog: eto-100.tem Components: eto1-100.cpt Components: eto2-100.cpt Data file: 2SterQ2017-1A06.CHR (c:\peak359) Data file: 1SterQ2017-1A06.CHR (c:\peak359) Sample: Abator Inlet Sample: Abator Outlet Operator: D. Kremer Operator: D. Kremer -1.600 16,000 -3.200 32.000 14.1310/0.100 Dead Vol / Air 0.0000/ 1.8545/0.216 ead Vol / Air 00000/ 0.0000/ 5.2207/ppn

Client: Sterigenics - Queensbury

Client ID: Run#1Aer Analysis date: 10/24/2017 09:12:08

Method: Direct Injection

Component Retention External Units Component Retention External Units Area Area Dead Vol / Air 0.216 1.8545 0.0000 Dead Vol / Air 0.100 14.1310 0.0000 Ethylene Oxide 0.483 2.1940 5.2207 ppm Ambient H2O 0.350 103.4600 0.0000 4.0485 5.2207 117.5910 0.0000

Client: Sterigenics - Queensbury

Client ID: Run#1Aer

Analysis date: 10/24/2017 09:12:08 Method: Direct Injection

Data file: 1SterQ2017-1A07.CHR (c:\peak359) Data file: 2SterQ2017-1A07.CHR (c:\peak359) Sample: Abator Outlet Sample: Abator Inlet Operator: D. Kremer Operator: D. Kremer 16.000 -3.200 -1.600 32.000 14.1280/0.066 Dead Vol / Air 0.0000/ 1.8065/0.233 lead Vol / Air 0.0000/ Ambient H2O 100.9490/0.366 2.0770/0.483 4.9423/ppm Component Retention Area **External Units** Component Retention External Units Area Dead Vol / Air 0.233 1.8065 0.0000 Dead Vol / Air 0.066 0.0000 14.1280

Ambient H2O

Lau Haine. Look

Client ID: Run#1Aer Analysis date: 10/24/2017 09:17:06

Carrier: HELIUM

Temp. prog: eto-100.tem Components: eto2-100.cpt

Method: Direct Injection

Client: Sterigenics - Queensbury

Description: CHANNEL 2 - PID Column: 1% SP-1000, Carbopack B

0.366

100.9490

115.0770

0.0000

0.0000

Lay Haille. LUGI

Client ID: Run#1Aer

Carrier: HELIUM

Temp. prog: eto-100.tem

Components: eto1-100.cpt

Ethylene Oxide

Analysis date: 10/24/2017 09:17:06

Method: Direct Injection

Client: Sterigenics - Queensbury

Description: CHANNEL 1 - FID
Column: 1% SP-1000, Carbopack B

0.483

2.0770

3.8835

4.9423 ppm

Components: eto2-100.cpt Components: eto1-100.cpt Data file: 2SterQ2017-1A08.CHR (c:\peak359)
Sample: Abator Outlet
Operator: D. Kremer Data file: 1SterQ2017-1A08.CHR (c:\peak359) Sample: Abator Inlet Operator: D. Kremer -1.600 16.000 -3,200 32.000 13.3630/0.066 Dead Vol / Air 0.0000/ 1.8305/0.216 0.00000 ead Vol / Air Ambient H2O 102.8145/0.366 0.0000/ 2.0330/0.483 4.8376/ppm Component Retention External Units Component Retention External Units Area Area

Dead Vol / Air

Ambient H2O

Lad Hairie, Ecoi

Client ID: Run#1Aer

Carrier: HELIUM

Temp. prog: eto-100.tem

Analysis date: 10/24/2017 09:22:03 Method: Direct Injection

Client: Sterigenics - Queensbury

Description: CHANNEL 2 - PID Column: 1% SP-1000, Carbopack B

0.066

0.366

0.0000

0.0000

0.0000

13.3630

102.8145

116.1775

Lad Haille. ECOI

Client ID: Run#1Aer

Carrier: HELIUM

Temp. prog: eto-100.tem

Analysis date: 10/24/2017 09:22:03

Method: Direct Injection

Description: CHANNEL 1 - FID

Client: Sterigenics - Queensbury

Column: 1% SP-1000, Carbopack B

0.216

0.483

Dead Vol / Air

Ethylene Oxide

0.0000

4.8376

4.8376 ppm

1.8305

2.0330

Components: eto1-100.cpt Components: eto2-100.cpt Data file: 2SterQ2017-1A09.CHR (c:\peak359) Data file: 1SterQ2017-1A09.CHR (c:\peak359) Sample: Abator Inlet Sample: Abator Outlet Operator: D. Kremer Operator: D. Kremer 32.000 External/Units 16,000 -3.200 -1.600 15.3370/0.083 Dead Vol / Air 0.0000/ 1.8175/0.216 ead Vol / Air Ambient H2O 0.0000/ 2 2480/0 483 Retention External Units External Units Component Area Component Retention Area

Dead Vol / Air

Ambient H2O

Client: Sterigenics - Queensbury

Column: 1% SP-1000, Carbopack B

0.083

0.366

0.0000

0.0000

0.0000

15.3370 101.2565

116.5935

Client ID: Run#1Aer

Carrier: HELIUM Temp. prog: eto-100.tem

Analysis date: 10/24/2017 09:27:22

Method: Direct Injection
Description: CHANNEL 2 - PID

Client: Sterigenics - Queensbury

Column: 1% SP-1000, Carbopack B

0.216

0.483

Dead Vol / Air

Ethylene Oxide

0.0000

5.3492

5.3492 ppm

1.8175

2.2480

4.0655

Client ID: Run#1Aer

Carrier: HELIUM

Temp. prog: eto-100.tem

Analysis date: 10/24/2017 09:27:22

Method: Direct Injection

Data file: 2SterQ2017-1A10.CHR (c:\peak359)
Sample: Abator Outlet
Operator: D. Kremer Data file: 1SterQ2017-1A10.CHR (c:\peak359) Sample: Abator Inlet Operator: D. Kremer -1.600 16.000 -3,200 32.000 15.1600/0.100 1.8055/0.216 0.0000/ Ambient H2O 101.1835/0.366 0.0000/ 5.7442/ppm Component Retention Area External Units Component Retention Area External Units Dead Vol / Air 0.216 1.8055 0.0000 Dead Vol / Air 0.100 15.1600 0.0000

Ambient H2O

5.7442 ppm

5.7442

Lad Haille. LVJi

Client ID: Run#1Aer

Carrier: HELIUM

Temp. prog: eto-100.tem Components: eto2-100.cpt

Analysis date: 10/24/2017 09:32:05

Method: Direct Injection
Description: CHANNEL 2 - PID

Client: Sterigenics - Queensbury

Column: 1% SP-1000, Carbopack B

0.366

101.1835

116.3435

0.0000

0.0000

Lab Haine. Looi

Client ID: Run#1Aer

Carrier: HELIUM

Temp. prog: eto-100.tem

Components: eto1-100.cpt

Ethylene Oxide

Analysis date: 10/24/2017 09:32:05

Method: Direct Injection

Description: CHANNEL 1 - FID

Client: Sterigenics - Queensbury

Column: 1% SP-1000, Carbopack B

0.483

2.4140

Data file: 2SterQ2017-1A11.CHR (c:\peak359) Data file: 1SterQ2017-1A11.CHR (c:\peak359) Sample: Abator Inlet Sample: Abator Outlet Operator: D. Kremer Operator: D. Kremer -1.600 16.000 -3.200 32.000 3.0570/0.083 ead Vol / Air 1.8030/0.216 0.0000 104.8110/0.350 0.0000/ External Units Component Retention Component Retention Area External Units

Dead Vol / Air

Ambient H2O

Client: Sterigenics - Queensbury

Column: 1% SP-1000, Carbopack B

0.083

0.350

13.0570

104.8110

117.8680

0.0000

0.0000

0.0000

Client ID: Run#1Aer

Carrier: HELIUM Temp. prog: eto-100.tem

Components: eto2-100.cpt

Analysis date: 10/24/2017 09:37:04

Method: Direct Injection

Description: CHANNEL 2 - PID

Client: Sterigenics - Queensbury

Column: 1% SP-1000, Carbopack B

0.216

0.466

1.8030

2.2220

4.0250

0.0000

5.2873

5.2873 ppm

Client ID: Run#1Aer

Carrier: HELIUM

Temp. prog: eto-100.tem Components: eto1-100.cpt

Dead Vol / Air

Ethylene Oxide

Analysis date: 10/24/2017 09:37:04

Method: Direct Injection

Description: CHANNEL 1 - FID Description: CHANNEL 2 - PID Column: 1% SP-1000, Carbopack B Column: 1% SP-1000, Carbopack B Carrier: HELIUM Carrier: HELIUM Temp. prog: eto-100.tem Temp. prog: eto-100.tem Components: eto1-100.cpt Components: eto2-100.cpt Data file: 2SterQ2017-1A12.CHR (c:\peak359)
Sample: Abator Outlet Data file: 1SterQ2017-1A12.CHR (c:\peak359)
Sample: Abator Inlet Operator: D. Kremer Operator: D. Kremer 32.000 External/Units -1.600 16.000 -3.200 Dead Voi / Air 0.0000/ 1.7785/0.233 ead Vol / Air 0.0000/ 2.1225/0.483 5.0506/ppm

Client Sterigenics - Queensbury

Client ID: Run#1Aer

Analysis date: 10/24/2017 09:42:20

Method: Direct Injection

Component	Retention	Агеа	External Units	Component	Retention	Area	External U	Jnits
Dead Vol / Air	0.233	1.7785	0.0000	Dead Vol / Air	0.083	15.3595	0.0000	
Ethylene Oxide	0.483	2.1225	5.0506 ppm	Ambient H2O	0.366	101.6630	0.0000	
		3.9010	5.0506			117.0225	0.0000	

Client: Sterigenics - Queensbury

Client ID: Run#1Aer

Analysis date: 10/24/2017 09:42:20

Method: Direct Injection

## **APPENDIX D**

Run #2 Chromatograms – Backvent



Temp. prog: eto-100.tem Components: eto2-100.cpt Components: eto1-100.cpt Data file: 1SterQ2017-2B01.CHR (c:\peak359) Data file: 2SterQ2017-2B01.CHR (c:\peak359) Sample: Abator Inlet Sample: Abator Outlet Operator: D. Kremer Operator: D. Kremer -1.600 16.000 -6.400 64.000 16.7070/0.083 Dead Vol / Air 0.0000/ Ambient H2O 115,9195/0,350 0.0000/ 9.4753/ppm Retention External Units Retention External Units Component Area Component Area Dead Vol / Air 0.216 1.7880 0.0000 Dead Vol / Air 0.083 16.7070 0.0000

Ambient H2O

Client: Sterigenics - Queensbury

Column: 1% SP-1000, Carbopack B

0.350

115.9195

132.6265

0.0000

0.0000

Client ID: Run#2BV

Carrier: HELIUM

Analysis date: 10/24/2017 11:32:42 Method: Direct Injection

Description: CHANNEL 2 - PID

Client: Sterigenics - Queensbury

Column: 1% SP-1000, Carbopack B

0.466

3.9820

5.7700

9.4753 ppm

9.4753

Client ID: Run#2BV

Carrier: HELIUM

Temp. prog: eto-100.tem

Ethylene Oxide

Analysis date: 10/24/2017 11:32:42 Method: Direct Injection Description: CHANNEL 1 - FID

Client: Sterigenics - Queensbury Client ID: Run#2BV Analysis date: 10/24/2017 11:33:52 Method: Direct Injection Description: CHANNEL 1 - FID

Column: 1% SP-1000, Carbopack B

Carrier: HELIUM Temp. prog: eto-100.tem Components: eto1-100.cpt

Lab Haille. Look

Data file: 1SterQ2017-2B02.CHR (c:\peak359) Sample: Abator Inlet

Operator: D. Kremer

Client: Sterigenics - Queensbury Client ID: Run#2BV

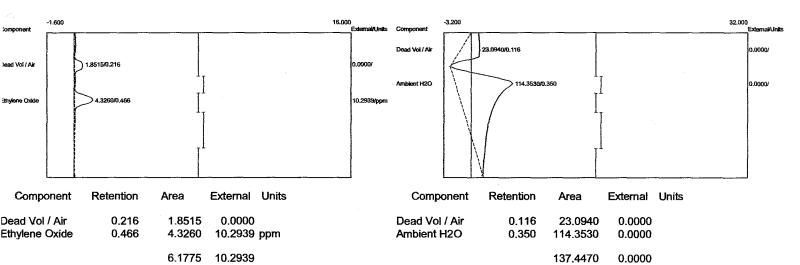
Analysis date: 10/24/2017 11:33:52

Method: Direct Injection Description: CHANNEL 2 - PID Column: 1% SP-1000, Carbopack B

Carrier: HELIUM Temp. prog: eto-100.tem Components: eto2-100.cpt

Data file: 2SterQ2017-2B02.CHR (c:\peak359)

Sample: Abator Outlet Operator: D. Kremer



Components: eto2-100.cpt Components: eto1-100.cpt Data file: 1SterQ2017-2B03.CHR (c:\peak359) Data file: 2SterQ2017-2B03.CHR (c:\peak359) Sample: Abator Outlet Sample: Abator Inlet Operator: D. Kremer Operator: D. Kremer -1.600 16.000 -6.400 64.000 26.2230/0.066 Dead Vol / Air 0.0000/ 1.7910/0.216 ead Vol/Air 0.0000/ thylene Oxide Component Retention External Units Retention Area Component Area External Units

Dead Vol / Air

Ambient H2O

Lad Hailie. Looi

Client ID: Run#2BV

Carrier: HELIUM

Temp. prog: eto-100.tem

Analysis date: 10/24/2017 11:34:56

Method: Direct Injection
Description: CHANNEL 2 - PID

Client: Sterigenics - Queensbury

Column: 1% SP-1000, Carbopack B

0.066

0.350

26.2230

115.3555

141.5785

0.0000

0.0000

0.0000

Lab Haille. LUGI

Client ID: Run#2BV

Carrier: HELIUM

Temp. prog: eto-100.tem

Dead Vol / Air

Ethylene Oxide

Analysis date: 10/24/2017 11:34:56

Method: Direct Injection

Description: CHANNEL 1 - FID

Client: Sterigenics - Queensbury

Column: 1% SP-1000, Carbopack B

0.216

0.466

1.7910

3.8070

5.5980

0.0000

9.0589

9.0589 ppm

Data file: 1SterQ2017-2B04.CHR (c:\peak359) Data file: 2SterQ2017-2B04.CHR (c:\peak359) Sample: Abator inlet Sample: Abator Outlet Operator: D. Kremer Operator: D. Kremer 16.000 64.000 -1.600 17.5160/0.066 Dead Vol / Air 0.0000/ 1.8045/0.216 0.0000/ ead Vol / Air Ambient H2O 119.3485/0.350 0.0000/ 3 7535/0.466 8.9316/ppm Component Retention Area External Units Component Retention Area External Units

Dead Vol / Air

Ambient H2O

0.0000

8.9316

8.9316 ppm

1.8045

3.7535

5.5580

Lau Haille. Loci

Client ID: Run#2BV Analysis date: 10/24/2017 11:36:07

Carrier: HELIUM

Temp. prog: eto-100.tem Components: eto2-100.cpt

Method: Direct Injection

Description: CHANNEL 2 - PID

Client: Sterigenics - Queensbury

Column: 1% SP-1000, Carbopack B

0.066

0.350

17.5160

119.3485

136.8645

0.0000

0.0000

0.0000

Lab Hallie. Look

Client ID: Run#2BV

Carrier: HELIUM

Temp. prog: eto-100.tem

Components: eto1-100.cpt

Dead Vol / Air

Ethylene Oxide

Analysis date: 10/24/2017 11:36:07 Method: Direct Injection

Client: Sterigenics - Queensbury

Description: CHANNEL 1 - FID Column: 1% SP-1000, Carbopack B

0.216

Data file: 2SterQ2017-2B05.CHR (c:\peak359) Data file: 1SterQ2017-2B05.CHR (c:\peak359) Sample: Abator Inlet Sample: Abator Outlet Operator: D. Kremer Operator: D. Kremer 64.000 External/Units -1.600 16.000 -6.400 20.5175/0.116 0.0000/ 1.8515/0.233 ead Vol / Air 0.0000/ 118,2160/0.350 0.0000/ Ambient H2O 3.7835/0.466 0.0030/ppm Component Retention External Units Area Component Retention Агеа External Units

Dead Vol / Air

Ambient H2O

Lab Haitie. Loci

Client ID: Run#2BV

Carrier: HELIUM

Temp. prog: eto-100.tem

Components: eto2-100.cpt

Analysis date: 10/24/2017 11:37:12

Method: Direct Injection

Description: CHANNEL 2 - PID

Client: Sterigenics - Queensbury

Column: 1% SP-1000, Carbopack B

0.116

0.350

20.5175

118.2160

138.7335

0.0000

0.0000

0.0000

Lav name. Loor

Client ID: Run#2BV

Carrier: HELIUM

Temp. prog: eto-100.tem

Components: eto1-100.cpt

Dead Vol / Air

Ethylene Oxide

Analysis date: 10/24/2017 11:37:12

Method: Direct Injection

Client: Sterigenics - Queensbury

Description: CHANNEL 1 - FID Column: 1% SP-1000, Carbopack B

0.233

0.466

1.8515

3.7835

5.6350

0.0000

9.0030

9.0030 ppm

Client: Sterigenics - Queensbury Client ID: Run#2BV Analysis date: 10/24/2017 11:38:18 Method: Direct Injection Description: CHANNEL 1 - FID Column: 1% SP-1000, Carbopack B

Carrier: HELIUM

Temp. prog: eto-100.tem Components: eto1-100.cpt

Lab hame. Looi

Data file: 1SterQ2017-2B06.CHR (c:\peak359)

Sample: Abator Inlet Operator: D. Kremer

Client: Sterigenics - Queensbury Client ID: Run#2BV

Analysis date: 10/24/2017 11:38:18

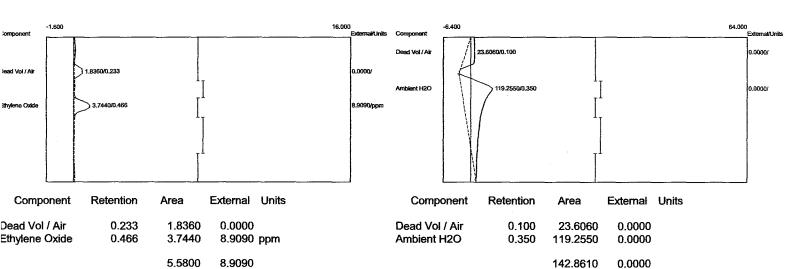
Method: Direct Injection Description: CHANNEL 2 - PID

Column: 1% SP-1000, Carbopack B Carrier: HELIUM Temp. prog: eto-100.tem Components: eto2-100 cpt

Lab Harrie. Loor

Data file: 2SterQ2017-2B06.CHR (c:\peak359)

Sample: Abator Outlet Operator: D. Kremer



Components: eto1-100.cpt Components: eto2-100.cpt Data file: 2SterQ2017-2B07.CHR (c:\peak359) Data file: 1SterQ2017-2B07.CHR (c:\peak359) Sample: Abator Inlet Sample: Abator Outlet Operator: D. Kremer Operator: D. Kremer 64.000 External/Units -1.600 16.000 -6.400 26.3390/0.116 Dead Vol / Air 0.0000/ 1.8855/0.216 ead Vol / Air n aana 121.4370/0.350 0.0000/ .9911/ppn Retention External Units

Component

Dead Vol / Air

Ambient H2O

Client: Sterigenics - Queensbury

Column: 1% SP-1000, Carbopack B

Retention

0.116

0.350

Area

26.3390

121.4370

147.7760

External Units

0.0000

0.0000

0.0000

Client ID: Run#2BV

Carrier: HELIUM

Temp. prog: eto-100.tem

Analysis date: 10/24/2017 11:39:26

Method: Direct Injection Description: CHANNEL 2 - PID

Client: Sterigenics - Queensbury

Column: 1% SP-1000, Carbopack B

Area

1.8855

3.7785

5.6640

0.0000

8.9911

8.9911 ppm

0.216

0.466

Client ID: Run#2BV

Carrier: HELIUM

Temp. prog: eto-100.tem

Component

Dead Vol / Air

Ethylene Oxide

Analysis date: 10/24/2017 11:39:26

Method: Direct Injection

Components: eto1-100.cpt Components: eto2-100.cpt Data file: 2SterQ2017-2B08.CHR (c:\peak359) Data file: 1SterQ2017-2B08.CHR (c:\peak359) Sample: Abator Inlet Sample: Abator Outlet Operator: D. Kremer Operator: D. Kremer 64.000 External/Units -1.600 16.000 -6,400 29.5490/0.116 0.0000/ Dead Vol / Air 1.8440/0.233 ead Vol/Air 0.0000/ 9.1231/ppm Retention External Units Component Area Component Retention External Units Area

Dead Vol / Air

Ambient H2O

Client: Sterigenics - Queensbury

Column: 1% SP-1000, Carbopack B

0.116

0.350

29.5490

118.7460

148.2950

0.0000

0.0000

0.0000

Client ID: Run#2BV Analysis date: 10/24/2017 11:40:33

Carrier: HELIUM

Temp. prog: eto-100.tem

Method: Direct Injection

Description: CHANNEL 2 - PID

Client: Sterigenics - Queensbury

Column: 1% SP-1000, Carbopack B

0.233

0.466

Dead Vol / Air

Ethylene Oxide

0.0000

9.1231

9.1231 ppm

1.8440

3.8340

5.6780

Client ID: Run#2BV

Carrier: HELIUM

Temp. prog: eto-100.tem

Analysis date: 10/24/2017 11:40:33

Method: Direct Injection
Description: CHANNEL 1 - FID

Data file: 2SterQ2017-2B09.CHR (c:\peak359) Sample: Abator Outlet Data file: 1SterQ2017-2B09.CHR (c:\peak359) Sample: Abator Inlet Operator: D. Kremer Operator: D. Kremer -1.600 16.000 64.000 31.7510/0.083 0.0000/ Dead Vol / Air 1.8285/0.216 ead Vol / Air 128.0255/0.350 Ambient H2O 0.0000/ ithylene Oxide 9.1969/ppm External Units Component Retention Area External Units Component Retention Area

Dead Vol / Air

Ambient H2O

LOD HOING, LOGI

Client ID: Run#2BV Analysis date: 10/24/2017 11:41:41

Carrier: HELIUM

Temp. prog: eto-100.tem Components: eto2-100.cpt

Method: Direct Injection
Description: CHANNEL 2 - PID

Client: Sterigenics - Queensbury

Column: 1% SP-1000, Carbopack B

0.083

0.350

31.7510

128.0255

159.7765

0.0000

0.0000

0.0000

Lau Haille. LUGI

Client ID: Run#2BV

Carrier: HELIUM

Temp. prog: eto-100.tem

Components: eto1-100.cpt

Dead Vol / Air

Ethylene Oxide

Analysis date: 10/24/2017 11:41:41 Method: Direct Injection

Description: CHANNEL 1 - FID

Client: Sterigenics - Queensbury

Column: 1% SP-1000, Carbopack B

0.216

0.466

0.0000

9.1969

9.1969 ppm

1.8285

3.8650

Description: CHANNEL 1 - FID Description: CHANNEL 2 - PID Column: 1% SP-1000, Carbopack B Column: 1% SP-1000, Carbopack B Carrier: HELIUM Carrier: HELIUM Temp. prog: eto-100.tem Temp. prog: eto-100.tem Components: eto1-100.cpt Components: eto2-100.cpt Data file: 1SterQ2017-2B10.CHR (c:\peak359) Data file: 2SterQ2017-2B10.CHR (c:\peak359) Sample: Abator Inlet Sample: Abator Outlet Operator: D. Kremer Operator: D. Kremer 64.000 External/Units 10.0000/ -1.600 1.8270/0.216 ead Vol / Air

Client: Sterigenics - Queensbury

Client ID: Run#2BV

Analysis date: 10/24/2017 11:42:53 Method: Direct Injection

Client: Sterigenics - Queensbury

Client ID: Run#2BV Analysis date: 10/24/2017 11:42:53 Method: Direct Injection

External Units Component Retention External Units Component Retention Area Area Dead Vol / Air 0.216 0.0000 0.016 23.0990 0.0000 Dead Vol / Air 1.8270 Ethylene Oxide Ambient H2O 0.0000 0.466 3.9020 9.2849 ppm 0.333 130.0140 5.7290 9.2849 153.1130 0.0000

Carrier: HELIUM Carrier: HELIUM Temp. prog: eto-100.tem Temp. prog: eto-100.tem Components: eto2-100.cpt Components: eto1-100.cpt Data file: 1SterQ2017-2B11.CHR (c:\peak359) Data file: 2SterQ2017-2B11.CHR (c:\peak359) Sample: Abator Inlet Sample: Abator Outlet Operator: D. Kremer Operator: D. Kremer -1.600 16.000 -6.400 64.000 19.6710/0.083 Dead Vol / Air 0.0000/ 1.8370/0.216 ead Vol/Air 133,1405/0,333 0.0000/

Component

Lab Hattie. Loci

Client ID: Run#2BV

Analysis date: 10/24/2017 11:44:36

Method: Direct Injection

Description: CHANNEL 2 - PID

Client: Sterigenics - Queensbury

Column: 1% SP-1000, Carbopack B

 Component
 Retention
 Area
 External
 Units

 Dead Vol / Air
 0.216
 1.8370
 0.0000

 Ethylene Oxide
 0.450
 3.8625
 9.1909 ppm

 5.6995
 9.1909

Lab name. Looi

Client ID: Run#2BV

Analysis date: 10/24/2017 11:44:36

Method: Direct Injection

Description: CHANNEL 1 - FID

Client: Sterigenics - Queensbury

Column: 1% SP-1000, Carbopack B

Dead Vol / Air 0.083 19.6710 0.0000 Ambient H2O 0.333 133.1405 0.0000 152.8115 0.0000

Area

External Units

Retention

Client: Sterigenics - Queensbury Client ID: Run#2BV Analysis date: 10/24/2017 11:45:42 Method: Direct Injection Description: CHANNEL 1 - FID Column: 1% SP-1000, Carbopack B Carrier: HELIUM Temp. prog: eto-100.tem

Components: eto1-100.cpt Data file: 1SterQ2017-2B12.CHR (c:\peak359) Sample: Abator Inlet

Operator: D. Kremer

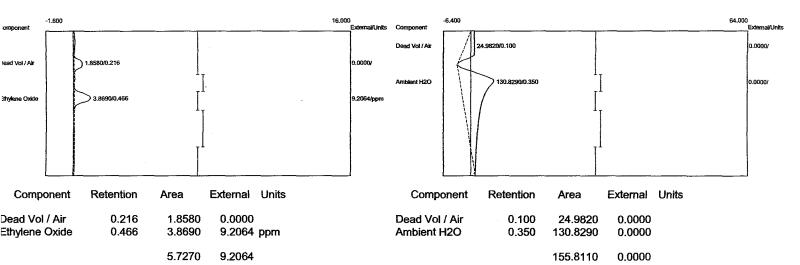
Client: Sterigenics - Queensbury Client ID: Run#2BV

Analysis date: 10/24/2017 11:45:42 Method: Direct Injection Description: CHANNEL 2 - PID

Column: 1% SP-1000, Carbopack B Carrier: HELIUM

Temp. prog: eto-100.tem Components: eto2-100.cpt

Data file: 2SterQ2017-2B12.CHR (c:\peak359)
Sample: Abator Outlet
Operator: D. Kremer



## APPENDIX E

Run #2 Chromatograms – Aeration



Data file: 2SterQ2017-2A01.CHR (c:\peak359) Data file: 1SterQ2017-2A01.CHR (c:\peak359) Sample: Abator Inlet Sample: Abator Outlet Operator: D. Kremer Operator: D. Kremer -1.600 16.000 -6.400 64.000 4.3950/0.066 0.0000/ 1.7720/0.216 Dead Vol / Air 107.7645/0.350 0.0000/ Retention External Units External Units Component Area Component Retention Area Dead Vol / Air 0.216 1.7720 0.0000 Dead Vol / Air 0.06614.3950 0.0000

Ambient H2O

Client: Sterigenics - Queensbury

Column: 1% SP-1000, Carbopack B

0.350

107.7645

122.1595

0.0000

0.0000

Client ID: Run#2Aer Analysis date: 10/24/2017 10:27:58

Carrier: HELIUM

Temp. prog: eto-100.tem

Components: eto2-100.cpt

Method: Direct Injection

Description: CHANNEL 2 - PID

Client: Sterigenics - Queensbury

Column: 1% SP-1000, Carbopack B

0.466

2.6540

4.4260

6.3153 ppm

6.3153

Client ID: Run#2Aer

Carrier: HELIUM

Temp. prog: eto-100.tem

Components: eto1-100.cpt

Ethylene Oxide

Analysis date: 10/24/2017 10:27:58

Temp. prog: eto-100.tem Components: eto2-100.cpt Components: eto1-100.cpt Data file: 2SterQ2017-2A02.CHR (c:\peak359) Data file: 1SterQ2017-2A02.CHR (c:\peak359) Sample: Abator Inlet Sample: Abator Outlet Operator: D. Kremer Operator: D. Kremer 64.000 -1.600 17.6050/0.083 1.8015/0.216 0.0000/ 101,7180/0,366 Ethviene Oxide 6.2843/ppm Component Retention External Units Component Retention Area External Units Area 0.0000 Dead Vol / Air 0.083 0.0000 Dead Vol / Air 0.216 1.8015 17.6050

Ambient H2O

Client: Sterigenics - Queensbury

Column: 1% SP-1000, Carbopack B

2.6410

4.4425

0.483

6.2843 ppm

6.2843

Client ID: Run#2Aer

Carrier: HELIUM

Temp. prog: eto-100.tem

Ethylene Oxide

Analysis date: 10/24/2017 10:32:14 Method: Direct Injection

Description: CHANNEL 1 - FID

Client: Sterigenics - Queensbury

Description: CHANNEL 2 - PID Column: 1% SP-1000, Carbopack B

0.366

101.7180

119.3230

0.0000

0.0000

Client ID: Run#2Aer

Carrier: HELIUM

Analysis date: 10/24/2017 10:32:14 Method: Direct Injection

Client: Sterigenics - Queensbury Client ID: Run#2Aer

Analysis date: 10/24/2017 10:37:04 Method: Direct Injection Description: CHANNEL 1 - FID

Column: 1% SP-1000, Carbopack B

Carrier: HELIUM Temp. prog: eto-100.tem Components: eto1-100.cpt

Data file: 1SterQ2017-2A03.CHR (c:\peak359)

Sample: Abator Inlet Operator: D. Kremer Client: Sterigenics - Queensbury

Client ID: Run#2Aer

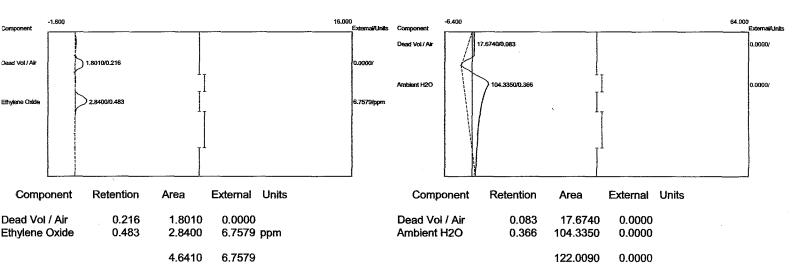
Analysis date: 10/24/2017 10:37:04 Method: Direct Injection Description: CHANNEL 2 - PID

Column: 1% SP-1000, Carbopack B

Carrier: HELIUM Temp. prog: eto-100.tem Components: eto2-100.cpt

Data file: 2SterQ2017-2A03.CHR (c:\peak359)

Sample: Abator Outlet Operator: D. Kremer



Data file: 1SterQ2017-2A04.CHR (c:\peak359) Data file: 2SterQ2017-2A04.CHR (c:\peak359) Sample: Abator Inlet Sample: Abator Outlet Operator: D. Kremer Operator: D. Kremer 64.000 -1.600 16.000 -6.400 17.3580/0.100 Dead Vol / Air 0.0000/ 1.7875/0.216 Dead Vol / Air 0.0000/ Ambient H2O 103,7585/0,366 .6567/ppm External Units Component Retention Агеа Component Retention External Units Area 0.216 0.0000 Dead Vol / Air Dead Vol / Air 1.7875 0.100 17.3580 0.0000

Ambient H2O

Client: Sterigenics - Queensbury

Column: 1% SP-1000, Carbopack B

0.366

103.7585

121.1165

0.0000

0.0000

Client ID: Run#2Aer

Carrier: HELIUM

Temp. prog: eto-100.tem

Components: eto2-100.cpt

Analysis date: 10/24/2017 10:42:21

Method: Direct Injection

Description: CHANNEL 2 - PID

Client: Sterigenics - Queensbury

Column: 1% SP-1000, Carbopack B

0.466

2.7975

4.5850

6.6567 ppm

6.6567

Client ID: Run#2Aer

Carrier: HELIUM

Temp. prog: eto-100.tem

Components: eto1-100.cpt

Ethylene Oxide

Analysis date: 10/24/2017 10:42:21

Method: Direct Injection

Data file: 2SterQ2017-2A05.CHR (c:\peak359) Data file: 1SterQ2017-2A05.CHR (c:\peak359) Sample: Abator Inlet Sample: Abator Outlet Operator: D. Kremer Operator: D. Kremer -1.600 16,000 -6.400 64.000 16.6420/0.066 0.0000/ Dead Vol / Air Dead Vol / Air 1.8085/0.216 0.0000/ Ambient H2O 104.5145/0.366 7.3551/ppm Component Retention External Units Component Retention External Units Area Area

Dead Vol / Air

Ambient H2O

Client: Sterigenics - Queensbury

Column: 1% SP-1000, Carbopack B

0.066

0.366

16.6420

104.5145

121.1565

0.0000

0.0000

0.0000

Client ID: Run#2Aer

Carrier: HELIUM

Temp. prog: eto-100.tem

Components: eto2-100.cpt

Analysis date: 10/24/2017 10:47:03

Method: Direct Injection

Description: CHANNEL 2 - PID

Client: Sterigenics - Queensbury

Column: 1% SP-1000, Carbopack B

0.216

0.483

0.0000

7.3551

7.3551 ppm

1.8085

3.0910

4.8995

Client ID: Run#2Aer

Carrier: HELIUM

Temp. prog: eto-100.tem

Components: eto1-100.cpt

Dead Vol / Air

Ethylene Oxide

Analysis date: 10/24/2017 10:47:03

Data file: 2SterQ2017-2A06.CHR (c:\peak359) Data file: 1SterQ2017-2A06.CHR (c:\peak359) Sample: Abator Inlet Sample: Abator Outlet Operator: D. Kremer Operator: D. Kremer -1.600 -6.400 64.000 17.2170/0.066 Dead Vol / Air ദ ദൈവ 1.7830/0.216 0.0000/ Ambient H2O 102.5845/0.350 0.0000/ 7.5978/ppm External Units External Units Component Retention Area Component Retention Area 0.216 1.7830 0.0000 Dead Vol / Air 0.066 17.2170 0.0000 Dead Vol / Air

Ambient H2O

Client: Sterigenics - Queensbury

Column: 1% SP-1000, Carbopack B

0.350

102.5845

119.8015

0.0000

0.0000

Client ID: Run#2Aer

Carrier: HELIUM Temp. prog: eto-100.tem Components: eto2-100.cpt

Analysis date: 10/24/2017 10:52:18 Method: Direct Injection

Description: CHANNEL 2 - PID

Client: Sterigenics - Queensbury

Column: 1% SP-1000, Carbopack B

0.466

3.1930

4.9760

7.5978 ppm

7.5978

Client ID: Run#2Aer

Carrier: HELIUM

Temp. prog: eto-100.tem Components: eto1-100.cpt

Ethylene Oxide

Analysis date: 10/24/2017 10:52:18

Data file: 1SterQ2017-2A07.CHR (c:\peak359)
Sample: Abator Inlet Data file: 2SterQ2017-2A07.CHR (c:\peak359) Sample: Abator Outlet Operator: D. Kremer Operator: D. Kremer 64.000 External/Units -1.600 16.000 -6.400 16.9740/0.100 0.0000/ 1.7915/0.216 0.0000/ 0.0000/ 7.9191/ppm Retention External Units Component Retention External Units Component Area Area Dead Vol / Air 0.216 1.7915 0.0000 Dead Vol / Air 0.100 16.9740 0.0000

Ambient H2O

Client: Sterigenics - Queensbury

Column: 1% SP-1000, Carbopack B

0.366

103.2170

120.1910

0.0000

0.0000

Client ID: Run#2Aer

Carrier: HELIUM

Temp. prog: eto-100.tem Components: eto2-100.cpt

Analysis date: 10/24/2017 10:57:03 Method: Direct Injection Description: CHANNEL 2 - PID

Client: Sterigenics - Queensbury

Column: 1% SP-1000, Carbopack B

0.483

3.3280

5.1195

7.9191 ppm

7.9191

Client ID: Run#2Aer

Carrier: HELIUM

Temp. prog: eto-100.tem

Components: eto1-100.cpt

Ethylene Oxide

Analysis date: 10/24/2017 10:57:03

Components: eto1-100.cpt Components: eto2-100.cpt Data file: 2SterQ2017-2A08.CHR (c:\peak359) Data file: 1SterQ2017-2A08.CHR (c:\peak359) Sample: Abator Inlet Sample: Abator Outlet Operator: D. Kremer Operator: D. Kremer -1.600 -6.400 64.000 18.1690/0.083 Dead Vol / Air 0.0000/ 1.8045/0.233 0.0000/ 100.5065/0.366 0.0000 3.7775/0.483 Component Retention Area External Units Component Retention Area External Units

Dead Vol / Air

Ambient H2O

0.0000

8.9887

8.9887 ppm

1.8045

3.77755.5820

Client: Sterigenics - Queensbury

Column: 1% SP-1000, Carbopack B

0.083

0.366

18.1690

100.5065

118.6755

0.0000

0.0000

0.0000

Client ID: Run#2Aer

Carrier: HELIUM

Temp. prog: eto-100.tem

Analysis date: 10/24/2017 11:02:17

Method: Direct Injection

Description: CHANNEL 2 - PID

Client: Sterigenics - Queensbury

Column: 1% SP-1000, Carbopack B

0.233

0.483

Client ID: Run#2Aer

Carrier: HELIUM

Temp. prog: eto-100.tem

Dead Vol / Air

Ethylene Oxide

Analysis date: 10/24/2017 11:02:17

Data file: 2SterQ2017-2A09.CHR (c:\peak359) Data file: 1SterQ2017-2A09.CHR (c:\peak359) Sample: Abator Outlet Sample: Abator Inlet Operator: D. Kremer Operator: D. Kremer 64.000 -1.600 16.000 17.7290/0.083 Dead Vot / Air 0.0000/ 1.7965/0.216 0.00007 Ambient H2O 104,6195/0.366 7.9976/ppm 3.3610/0.466 Ethylene Oxide Retention External Units External Units Component Area Component Retention Area 0.083 0.0000 0.216 1.7965 0.0000 Dead Vol / Air 17.7290 Dead Vol / Air

Ambient H2O

Client: Sterigenics - Queensbury

Column: 1% SP-1000, Carbopack B

0.366

104.6195

122.3485

0.0000

0.0000

Client ID: Run#2Aer Analysis date: 10/24/2017 11:07:02

Carrier: HELIUM

Temp. prog: eto-100.tem

Components: eto2-100.cpt

Method: Direct Injection
Description: CHANNEL 2 - PID

Client: Sterigenics - Queensbury

Column: 1% SP-1000, Carbopack B

0.466

3.3610

5.1575

7.9976 ppm

7.9976

Client ID: Run#2Aer

Carrier: HELIUM

Temp. prog: eto-100.tem

Components: eto1-100.cpt

Ethylene Oxide

Analysis date: 10/24/2017 11:07:02 Method: Direct Injection

Components: eto2-100.cpt Components: eto1-100.cpt Data file: 1SterQ2017-2A10.CHR (c:\peak359) Data file: 2SterQ2017-2A10.CHR (c:\peak359) Sample: Abator inlet Sample: Abator Outlet Operator: D. Kremer Operator: D. Kremer -6.400 64.000 -1.600 16.000 External/Units 17.6650/0.100 0.0000/ 1.7945/0.216 0.0000/ External Units Retention Area External Units Component Retention Area Component Dead Vol / Air 0.216 1.7945 0.0000 Dead Vol / Air 0.100 17.6650 0.0000

Ambient H2O

Client: Sterigenics - Queensbury

Column: 1% SP-1000, Carbopack B

0.366

99.8700

117.5350

0.0000

0.0000

Client ID: Run#2Aer

Carrier: HELIUM

Temp. prog: eto-100.tem

Analysis date: 10/24/2017 11:12:20 Method: Direct Injection

Description: CHANNEL 2 - PID

Client: Sterigenics - Queensbury

Column: 1% SP-1000, Carbopack B

0.483

3.4895

5.2840

8.3034 ppm

8.3034

Client ID: Run#2Aer Analysis date: 10/24/2017 11:12:20 Method: Direct Injection

Carrier: HELIUM Temp. prog: eto-100.tem

Ethylene Oxide

Components: eto1-100.cpt Components: eto2-100.cpt Data file: 1SterQ2017-2A11.CHR (c:\peak359)
Sample: Abator Inlet Data file: 2SterQ2017-2A11.CHR (c:\peak359) Sample: Abator Outlet Operator: D. Kremer Operator: D. Kremer -1.600 16.000 -6.400 64.000 0.0000/ 1.7755/0.233 Dead Vol / Air 0.0000/ Amblent H2O 0.0000/ Component Retention Area External Units Component Retention Area External Units

Dead Vol / Air

Ambient H2O

Lab Haille, Loci

Client ID: Run#2Aer

Carrier: HELIUM

Temp. prog: eto-100.tem

Analysis date: 10/24/2017 11:17:34

Method: Direct Injection
Description: CHANNEL 2 - PID

Client: Sterigenics - Queensbury

Column: 1% SP-1000, Carbopack B

0.083

0.366

16.9850

99.5680

116.5530

0.0000

0.0000

0.0000

TIGHTO. LOCA

Client ID: Run#2Aer

Carrier: HELIUM

Temp. prog: eto-100.tem

Dead Vol / Air

Ethylene Oxide

Analysis date: 10/24/2017 11:17:34

Method: Direct Injection

Description: CHANNEL 1 - FID

Client: Sterigenics - Queensbury

Column: 1% SP-1000, Carbopack B

0.233

0.483

1.7755

3.3715

5.1470

0.0000

8.0226

8.0226 ppm

Data file: 2SterQ2017-2A12.CHR (c:\peak359) Data file: 1SterQ2017-2A12.CHR (c:\peak359) Sample: Abator Outlet Sample: Abator Inlet Operator: D. Kremer Operator: D. Kremer 64.000 16.000 -1.600 16.9000/0.066 Dead Vol / Air 1.8650/0.233 7.9167/ppm 3.3270/0.483 External Units External Units Component Retention Area Component Retention Area 0.066 16.9000 0.0000 0.0000 Dead Vol / Air 0.233 1.8650 Dead Vol / Air

Ambient H2O

Lab Haille. LCOI

Client ID: Run#2Aer

Carrier: HELIUM Temp. prog: eto-100.tem

Components: eto2-100.cpt

Analysis date: 10/24/2017 11:22:03

Method: Direct Injection

Description: CHANNEL 2 - PID

Client: Sterigenics - Queensbury

Column: 1% SP-1000, Carbopack B

0.366

100.8810

117.7810

0.0000

0.0000

Lab name: ECSI

Client ID: Run#2Aer

Temp. prog: eto-100.tem

Components: eto1-100.cpt

Ethylene Oxide

Analysis date: 10/24/2017 11:22:03

Method: Direct Injection

Description: CHANNEL 1 - FID

Client: Sterigenics - Queensbury

Column: 1% SP-1000, Carbopack B Carrier: HELIUM

3.3270

5.1920

0.483

7.9167 ppm

7.9167

## APPENDIX F

Run #3 Chromatograms – Backvent



Components: eto1-100.cpt Components: eto2-100.cpt
Data file: 2SterQ2017-3B01.CHR (c:\peak359) Data file: 1SterQ2017-3B01.CHR (c:\peak359) Sample: Abator inlet Sample: Abator Outlet Operator: D. Kremer Operator: D. Kremer -1.600 64.000 Component Dead Vol / Air 27.7805/0.033 0.0000/ 0.0000/ Ambient H2O 3 4090/0 483 8.1118/ppm Component Retention External Units Area Component Retention External Units Area 0.0000 Dead Vol / Air 0.233 1.8320 Dead Vol / Air 0.033 27.7805 0.0000

Ambient H2O

Client: Sterigenics - Queensbury

Column: 1% SP-1000, Carbopack B

0.366

149.8390

177.6195

0.0000

0.0000

Client ID: Run#3BV

Carrier: HELIUM

Temp. prog: eto-100.tem

Analysis date: 10/24/2017 12:51:02

Method: Direct Injection

Description: CHANNEL 2 - PID

Client: Sterigenics - Queensbury

Column: 1% SP-1000, Carbopack B

0.483

3.4090

5.2410

8.1118 ppm

8.1118

Client ID: Run#3BV

Carrier: HELIUM

Temp. prog: eto-100.tem

Ethylene Oxide

Analysis date: 10/24/2017 12:51:02

Method: Direct Injection

Components: eto1-100.cpt Components: eto2-100.cpt Data file: 1SterQ2017-3B02.CHR (c:\peak359) Data file: 2SterQ2017-3B02.CHR (c:\peak359) Sample: Abator Inlet Sample: Abator Outlet Operator: D. Kremer Operator: D. Kremer 16.000 64.000 Component 23.8420/0.066 0.0000/ Dead Vol / Ale 2.1960/0.216 18.5104/ppn 0.5120/0.700 Retention External Units Component Retention External Units Component Area Area Dead Vol / Air 0.216 2.1960 0.0000 Dead Vol / Air 0.066 23.8420 0.0000

Ambient H2O

Client: Sterigenics - Queensbury

Column: 1% SP-1000, Carbopack B

0.350

147.0440

170.8860

0.0000

0.0000

Client ID: Run#3BV

Carrier: HELIUM

Temp. prog: eto-100.tem

Analysis date: 10/24/2017 12:52:05

Method: Direct Injection

Description: CHANNEL 2 - PID

Client: Sterigenics - Queensbury

Column: 1% SP-1000, Carbopack B

7.7790

0.5120

10.4870

18.5104 ppm

0.0000

18.5104

0.483

0.700

Client ID: Run#3BV

Carrier: HELIUM

Temp. prog: eto-100.tem

Ethylene Oxide

Acetaldehyde

Analysis date: 10/24/2017 12:52:05

Method: Direct Injection

Description: CHANNEL 2 - PID Column: 1% SP-1000, Carbopack B Description: CHANNEL 1 - FID Column: 1% SP-1000, Carbopack B Carrier: HELIUM Carrier: HELIUM Temp. prog: eto-100.tem Temp. prog: eto-100.tem Components: eto1-100.cpt Components: eto2-100.cpt Data file: 1SterQ2017-3B03.CHR (c:\peak359) Data file: 2SterQ2017-3B03.CHR (c:\peak359) Sample: Abator Inlet Sample: Abator Outlet Operator: D. Kremer Operator: D. Kremer -1.600 16.000 -6.400 64.000 21.1640/0.066 Dead Vol / Air 0.0000/ 1.7715/0.216 0.0000/ 40.8165/0.350 0.0000/ 4.2130/0.483 Ethylene Oxide 10.0250/ppm

Client: Sterigenics - Queensbury

Client ID: Run#3BV

Analysis date: 10/24/2017 12:53:23 Method: Direct Injection

Client: Sterigenics - Queensbury

Client ID: Run#3BV

Analysis date: 10/24/2017 12:53:23 Method: Direct Injection

Component Retention Area External Units Component Retention Area External Units Dead Vol / Air 0.216 1.7715 0.0000 Dead Vol / Air 0.066 21.1640 0.0000 Ethylene Oxide 0.483 4.2130 10.0250 ppm Ambient H2O 0.350 140.8165 0.0000 5.9845 10.0250 161.9805 0.0000

Components: eto1-100.cpt Components: eto2-100.cpt Data file: 1SterQ2017-3B04.CHR (c:\peak359) Data file: 2SterQ2017-3B04.CHR (c:\peak359) Sample: Abator Inlet Sample: Abator Outlet Operator: D. Kremer Operator: D. Kremer -1.600 16.000 -6.400 64.000 Dead Vol / Air 20.0240/0.083 0.0000/ 0.0000/ Ambient H2O 0.0000/ 9.5657/ppm External Units Component Retention Area Component Retention External Units Area Dead Vol / Air 0.233 1.8080 0.0000 Dead Vol / Air 0.083 20.0240 0.0000

Ambient H2O

9.5657 ppm

9.5657

Client: Sterigenics - Queensbury

Column: 1% SP-1000, Carbopack B

0.366

139.1430

159.1670

0.0000

0.0000

Client ID: Run#3BV Analysis date: 10/24/2017 12:54:40 Method: Direct Injection

Carrier: HELIUM Temp. prog: eto-100.tem

Description: CHANNÉL 2 - PID

Client: Sterigenics - Queensbury

Column: 1% SP-1000, Carbopack B

0.483

4.0200

5.8280

Client ID: Run#3BV

Carrier: HELIUM

Temp. prog: eto-100.tem

Ethylene Oxide

Analysis date: 10/24/2017 12:54:40 Method: Direct Injection Description: CHANNEL 1 - FID

Data file: 1SterQ2017-3B05.CHR (c:\peak359) Data file: 2SterQ2017-3B05.CHR (c:\peak359) Sample: Abator Outlet Sample: Abator Inlet Operator: D. Kremer Operator: D. Kremer 64.000 External/Uni -1.600 16.000 -6.400 Dead Vol / Air .4650/0.133 0.0000/ 1.7775/0.233 0.0000/ Dead Vol/Alr Ambient H2O .0000/ 3.7750/0.483 8.9827/ppm Component Retention Area External Units Component Retention Area External Units 0.233 0.0000 Dead Vol / Air 0.133 20.4650 0.0000

Ambient H2O

Client: Sterigenics - Queensbury

Column: 1% SP-1000, Carbopack B

0.366

137.6260

158.0910

0.0000

0.0000

Client ID: Run#3BV

Carrier: HELIUM

Temp. prog: eto-100.tem Components: eto2-100.cpt

Analysis date: 10/24/2017 12:55:45

Method: Direct Injection

Description: CHANNEL 2 - PID

Client: Sterigenics - Queensbury

Description: CHANNEL 1 - FID Column: 1% SP-1000, Carbopack B

1.7775

3.7750

5.5525

8.9827 ppm

8.9827

0.483

Client ID: Run#3BV

Carrier: HELIUM

Temp. prog: eto-100.tem

Components: eto1-100.cpt

Dead Vol / Air

Ethylene Oxide

Analysis date: 10/24/2017 12:55:45

Method: Direct Injection

Client: Sterigenics - Queensbury Client ID: Run#3BV Analysis date: 10/24/2017 12:56:55 Method: Direct Injection Description: CHANNEL 1 - FID Column: 1% SP-1000, Carbopack B

Carrier: HELIUM
Temp, prog: eto-100.tem

Temp. prog: eto-100.tem Components: eto1-100.cpt

Data file: 1SterQ2017-3B06.CHR (c:\peak359)

Sample: Abator Inlet Operator: D. Kremer

Client: Sterigenics - Queensbury

Client ID: Run#3BV

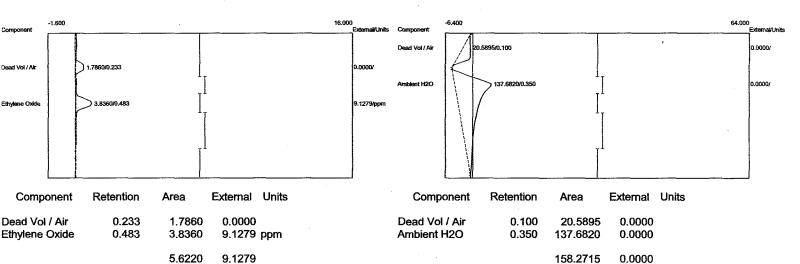
Analysis date: 10/24/2017 12:56:55
Method: Direct Injection
Description: CHANNEL 2 - PID

Column: 1% SP-1000, Carbopack B

Carrier: HELIUM Temp. prog: eto-100.tem Components: eto2-100.cpt

Data file: 2SterQ2017-3B06.CHR (c:\peak359)

Sample: Abator Outlet Operator: D. Kremer



Data file: 2SterQ2017-3B07.CHR (c:\peak359) Data file: 1SterQ2017-3B07.CHR (c:\peak359) Sample: Abator Inlet Sample: Abator Outlet Operator: D. Kremer Operator: D. Kremer -6.400 64.000 -1.600 16.000 20.2100/0.083 0.0000/ 1.8015/0.233 Ambient H2O 0.0000/ Ethylene Oxide 9.0517/ppm Component Retention Area External Units Component Retention External Units Area 0.0000 Dead Vol / Air 0.233 1.8015 Dead Vol / Air 0.083 20.2100 0.0000

Ambient H2O

Client: Sterigenics - Queensbury

Column: 1% SP-1000, Carbopack B

0.366

138.5300

158.7400

0.0000

0.0000

Client ID: Run#3BV

Carrier: HELIUM

Temp. prog: eto-100.tem

Components: eto2-100.cpt

Analysis date: 10/24/2017 12:58:05 Method: Direct Injection

Description: CHANNEL 2 - PID

Client: Sterigenics - Queensbury

Column: 1% SP-1000, Carbopack B

0.483

3.8040

5.6055

9.0517 ppm

9.0517

Client ID: Run#3BV

Carrier: HELIUM

Temp. prog: eto-100.tem

Components: eto1-100.cpt

Ethylene Oxide

Analysis date: 10/24/2017 12:58:05 Method: Direct Injection Description: CHANNEL 1 - FID

Components: eto1-100.cpt Components: eto2-100.cpt Data file: 2SterQ2017-3B08.CHR (c:\peak359) Data file: 1SterQ2017-3B08.CHR (c:\peak359) Sample: Abator Inlet Sample: Abator Outlet Operator: D. Kremer Operator: D. Kremer -1,600 16.000 -6.400 64.000 18.6850/0.083 lead Voi / Air 1.7825/0.216 0.00000 9.0327/ppm Component Retention External Units Component Retention External Units Area Area

Dead Vol / Air

Ambient H2O

Client: Sterigenics - Queensbury

Column: 1% SP-1000, Carbopack B

0.083

0.350

0.0000

0.0000

0.0000

18.6850

138.8955

157.5805

Client ID: Run#3BV

Carrier: HELIUM

Temp. prog: eto-100.tem

Analysis date: 10/24/2017 12:59:10

Method: Direct Injection

Description: CHANNEL 2 - PID

Client: Sterigenics - Queensbury

Column: 1% SP-1000, Carbopack B

0.216

0.466

Dead Vol / Air

Ethylene Oxide

0.0000

9.0327

9.0327 ppm

1.7825

3.7960

5.5785

Client ID: Run#3BV Analysis date: 10/24/2017 12:59:10

Carrier: HELIUM

Temp. prog: eto-100.tem

Method: Direct Injection

Components: eto1-100.cpt Components: eto2-100.cpt Data file: 1SterQ2017-3B09.CHR (c:\peak359) Data file: 2SterQ2017-3B09.CHR (c:\peak359) Sample: Abator Inlet Sample: Abator Outlet Operator: D. Kremer Operator: D. Kremer -1.600 16,000 -6.400 64.000 9.3325/0.116 0.0000/ 1.7795/0.216 ead Vol / Air 0.0000/ 3.8590/0.483 Area External Units Component Retention Component Retention External Units Area

Dead Vol / Air

Ambient H2O

Client: Sterigenics - Queensbury

Column: 1% SP-1000, Carbopack B

0.116

0.350

0.0000

0.0000

0.0000

19.3325

141.1785

160.5110

Client ID: Run#3BV

Carrier: HELIUM

Temp. prog: eto-100.tem

Analysis date: 10/24/2017 13:00:49

Method: Direct Injection

Description: CHANNEL 2 - PID

Client: Sterigenics - Queensbury

Column: 1% SP-1000, Carbopack B

0.216

0.483

Dead Vol / Air

Ethylene Oxide

0.0000

9.1826

9.1826 ppm

1.7795

3.8590

5.6385

Client ID: Run#3BV

Carrier: HELIUM

Temp. prog: eto-100.tem

Analysis date: 10/24/2017 13:00:49

Method: Direct Injection

Components: eto1-100.cpt Data file: 2SterQ2017-3B10.CHR (c:\peak359) Data file: 1SterQ2017-3B10.CHR (c:\peak359) Sample: Abator Inlet Sample: Abator Outlet Operator: D. Kremer Operator: D. Kremer 64.000 External/Units 16.000 -6.400 -1.600 0.0000/ 1.7930/0.233 0.0000/ ead Vol/Air 0.0000/ External Units Component Retention Area Component Retention Area External Units

Dead Vol / Air

Ambient H2O

Client: Sterigenics - Queensbury

Column: 1% SP-1000, Carbopack B

0.083

0.350

19.9345

137.9355

157.8700

0.0000

0.0000

0.0000

Client ID: Run#3BV

Carrier: HELIUM Temp. prog: eto-100.tem

Components: eto2-100.cpt

Analysis date: 10/24/2017 13:02:12

Method: Direct Injection Description: CHANNEL 2 - PID

Client: Sterigenics - Queensbury

Column: 1% SP-1000, Carbopack B

0.233

0.483

1.7930

3.6990

5.4920

0.0000

8.8019

8.8019 ppm

Client ID: Run#3BV Analysis date: 10/24/2017 13:02:12

Carrier: HELIUM

Temp. prog: eto-100.tem

Dead Vol / Air

Ethylene Oxide

Method: Direct Injection

Data file: 1SterQ2017-3B11.CHR (c:\peak359) Data file: 2SterQ2017-3B11.CHR (c:\peak359) Sample: Abator Inlet Sample: Abator Outlet Operator: D. Kremer Operator: D. Kremer 64.000 External/Units -1.600 16.000 -6.400 9.9025/0.116 Dead Vol / Ala 0.0000/ 1.7740/0.233 0.0000/ ead Vol / Air Ambient H2O 0.0000/ 8.5187/ppm Component Retention Area External Units Component Retention Area External Units Dead Vol / Air 0.233 0.0000

Dead Vol / Air

Ambient H2O

Client: Sterigenics - Queensbury

Column: 1% SP-1000, Carbopack B

0.116

0.350

19.9025

134.7480

154.6505

0.0000

0.0000

0.0000

Client ID: Run#3BV

Carrier: HELIUM

Temp. prog: eto-100.tem Components: eto2-100.cpt

Analysis date: 10/24/2017 13:03:36

Method: Direct Injection Description: CHANNÉL 2 - PID

Client: Sterigenics - Queensbury

Column: 1% SP-1000, Carbopack B

1.7740

3.5800

5.3540

0.483

8.5187 ppm

8.5187

Client ID: Run#3BV

Carrier: HELIUM

Temp. prog: eto-100.tem

Components: eto1-100.cpt

Ethylene Oxide

Analysis date: 10/24/2017 13:03:36

Method: Direct Injection

Data file: 2SterQ2017-3B12.CHR (c:\peak359) Data file: 1SterQ2017-3B12.CHR (c:\peak359) Sample: Abator Inlet Sample: Abator Outlet Operator: D. Kremer Operator: D. Kremer -1.600 16.000 -6,400 64.000 8.6655/0.100 Dead Vol / Air 0.0000/ 1.7850/0.216 0.00007 ead Vol / Air 0.0000/ 3.5187/ppm Retention External Units Component Area Component Retention External Units Area 0.216 0.0000 Dead Vol / Air 1.7850 Dead Vol / Air 0.100 18.6655 0.0000

Ambient H2O

Client: Sterigenics - Queensbury

Column: 1% SP-1000, Carbopack B

0.350

139.7530

158.4185

0.0000

0.0000

Client ID: Run#3BV

Carrier: HELIUM

Temp. prog: eto-100.tem

Components: eto2-100.cpt

Analysis date: 10/24/2017 13:04:50

Method: Direct Injection
Description: CHANNEL 2 - PID

Client: Sterigenics - Queensbury

Column: 1% SP-1000, Carbopack B

0.466

3.5800

5.3650

8.5187 ppm

8.5187

Client ID: Run#3BV

Carrier: HELIUM

Temp. prog: eto-100.tem

Components: eto1-100.cpt

Ethylene Oxide

Analysis date: 10/24/2017 13:04:50

Method: Direct Injection

## **APPENDIX G**

Run #3 Chromatograms – Aeration



Data file: 1SterQ2017-3A01.CHR (c:\peak359) Sample: Abator Inlet Data file: 2SterQ2017-3A01.CHR (c:\peak359) Sample: Abator Outlet Operator: D. Kremer Operator: D. Kremer 16.000 -6,400 64.000 -1.600 Component External/Units 20.4420/0.100 Dead Vol / Air 0.0000 1.8440/0.216 )ead Vol / Air 0.0000/ 142.3195/0.333 0.0000/ Ambient H2O Retention **External Units** External Units Component Area Component Retention Area

Dead Vol / Air

Ambient H2O

Client: Sterigenics - Queensbury

Column: 1% SP-1000, Carbopack B

0.100

0.333

20.4420

142.3195

162.7615

0.0000

0.0000

0.0000

Client ID: Run#3Aer

Carrier: HELIUM

Temp. prog: eto-100.tem

Components: eto2-100.cpt

Analysis date: 10/24/2017 11:49:24

Method: Direct Injection
Description: CHANNEL 2 - PID

Client: Sterigenics - Queensbury

Column: 1% SP-1000, Carbopack B

0.216

0.466

1.8440

3.8690

5.7130

0.0000

9.2064

9.2064 ppm

Client ID: Run#3Aer

Carrier: HELIUM

Temp. prog: eto-100.tem

Components: eto1-100.cpt

Dead Vol / Air

Ethylene Oxide

Analysis date: 10/24/2017 11:49:24

Method: Direct Injection

Data file: 2SterQ2017-3A02.CHR (c:\peak359) Data file: 1SterQ2017-3A02.CHR (c:\peak359) Sample: Abator Inlet Sample: Abator Outlet Operator: D. Kremer Operator: D. Kremer -1.600 16.000 -6.460 64.000 22.6490/0.066 Dead Vol / Air 0.0000/ niA \ InV head 1.8605/0.216 0.0000/ 0.0000/ External Units Component Retention Area Component Retention External Units Area

Dead Vol / Air

Ambient H2O

Client: Sterigenics - Queensbury

Column: 1% SP-1000, Carbopack B

0.066

0.350

22.6490

135.1760

157.8250

0.0000

0.0000

0.0000

Client ID: Run#3Aer

Carrier: HELIUM

Temp. prog: eto-100.tem

Components: eto2-100.cpt

Analysis date: 10/24/2017 11:54:04

Method: Direct Injection

Description: CHANNEL 2 - PID

Client: Sterigenics - Queensbury

Column: 1% SP-1000, Carbopack B

0.216

0.466

1.8605

3.8370

5.6975

0.0000

9.1303

9.1303 ppm

Client ID: Run#3Aer

Carrier: HELIUM

Temp. prog: eto-100.tem

Components: eto1-100.cpt

Dead Vol / Air

Ethylene Oxide

Analysis date: 10/24/2017 11:54:04

Method: Direct Injection

Temp. prog: eto-100.tem Temp. prog: eto-100.tem Components: eto1-100.cpt Components: eto2-100.cpt Data file: 2SterQ2017-3A03.CHR (c:\peak359) Data file: 1SterQ2017-3A03.CHR (c:\peak359) Sample: Abator inlet Sample: Abator Outlet Operator: D. Kremer Operator: D. Kremer -1.600 16.000 -6.400 64.000 Dead Vol / Air 21.3050/0.116 0.00001 1.8730/0.216 ead Vol / Air 3,8555/0,466 9.1743/ppm External Units Component Retention Area Component Retention Area External Units 0.0000 Dead Vol / Air 0.0000 Dead Vol / Air 0.216 1.8730 0.116 21.3050

Ambient H2O

Client: Sterigenics - Queensbury

Column: 1% SP-1000, Carbopack B

0.333

140.4745

161.7795

0.0000

0.0000

Client ID: Run#3Aer

Carrier: HELIUM

Analysis date: 10/24/2017 11:59:03 Method: Direct Injection

Description: CHANNEL 2 - PID

Client: Sterigenics - Queensbury

Column: 1% SP-1000, Carbopack B

0.466

3.8555

5.7285

9.1743 ppm

9.1743

Client ID: Run#3Aer Analysis date: 10/24/2017 11:59:03

Carrier: HELIUM

Ethylene Oxide

Components: eto1-100.cpt Components: eto2-100.cpt Data file: 2SterQ2017-3A04.CHR (c:\peak359) Data file: 1SterQ2017-3A04.CHR (c:\peak359) Sample: Abator Inlet Sample: Abator Outlet Operator: D. Kremer Operator: D. Kremer -1.600 Component Component Dead Vol / Air 21,9140/0.016 1.8550/0.216 0.0000/ lead Vol / Air Ambient H2O 9.1350/ppm Retention External Units Component Retention External Units Component Агеа Area

Dead Vol / Air

Ambient H2O

Client: Sterigenics - Queensbury

Column: 1% SP-1000, Carbopack B

0.216

0.450

Dead Vol / Air Ethylene Oxide 1.8550

3.8390

5.6940

0.0000

9.1350

9.1350 ppm

Client ID: Run#3Aer Analysis date: 10/24/2017 12:04:20

Carrier: HELIUM Temp. prog: eto-100.tem

Method: Direct Injection

Description: CHANNEL 1 - FID

Client: Sterigenics - Queensbury

Column: 1% SP-1000, Carbopack B

0.016

0.333

21.9140

138.5885

160.5025

0.0000

0.0000

0.0000

Client ID: Run#3Aer

Carrier: HELIUM

Temp. prog: eto-100.tem

Analysis date: 10/24/2017 12:04:20

Method: Direct Injection

Data file: 2SterQ2017-3A05.CHR (c:\peak359) Data file: 1SterQ2017-3A05.CHR (c:\peak359) Sample: Abator Inlet Sample: Abator Outlet Operator: D. Kremer Operator: D. Kremer -1.600 16.000 -6.400 64.000 22.7170/0.083 0.0000/ ead Vol / Air 1.8790/0.216 le annar 0.0000/ Retention Units Component Retention External Units Component Area External Area

Dead Vol / Air

Ambient H2O

Client: Sterigenics - Queensbury

Column: 1% SP-1000, Carbopack B

0.083

0.350

22.7170

134.9845

157.7015

0.0000

0.0000

0.0000

Client ID: Run#3Aer Analysis date: 10/24/2017 12:09:03

Carrier: HELIUM

Temp. prog: eto-100.tem Components: eto2-100.cpt

Method: Direct Injection
Description: CHANNEL 2 - PID

Lad Hallic. Look

Client ID: Run#3Aer

Carrier: HELIUM

Temp. prog: eto-100.tem

Components: eto1-100.cpt

Dead Vol / Air

Ethylene Oxide

Analysis date: 10/24/2017 12:09:03 Method: Direct Injection

Description: CHANNEL 1 - FID

Client: Sterigenics - Queensbury

Column: 1% SP-1000, Carbopack B

0.216

0.466

1.8790

3.9425

5.8215

0.0000

9.3813

9.3813 ppm

Data file: 1SterQ2017-3A06.CHR (c:\peak359)
Sample: Abator Inlet Data file: 2SterQ2017-3A06.CHR (c:\peak359) Sample: Abator Outlet Operator: D. Kremer Operator: D. Kremer 64.000 External/Units -1.600 16.000 -6.400 Dead Vot / Air 24.3650/0.100 0.0000/ 1,8610/0,233 0.0000/ lead Vol / Air 138.0510/0.350 0.0000/ Ambient H2O 9.3004/ppm Component Retention Area External Units Component Retention Area External Units Dead Vol / Air 0.233 1.8610 0.0000 Dead Vol / Air 0.100 24.3650 0.0000

**Ambient H2O** 

Lab flattic. Loci

Client ID: Run#3Aer Analysis date: 10/24/2017 12:14:05

Carrier: HELIUM

Temp. prog: eto-100.tem

Components: eto2-100.cpt

Method: Direct Injection
Description: CHANNEL 2 - PID

Client: Sterigenics - Queensbury

Column: 1% SP-1000, Carbopack B

0.350

138.0510

162.4160

0.0000

0.0000

Lab Haille. LUGI

Client ID: Run#3Aer

Carrier: HELIUM

Temp. prog: eto-100.tem

Components: eto1-100.cpt

Ethylene Oxide

Analysis date: 10/24/2017 12:14:05 Method: Direct Injection

Description: CHANNEL 1 - FID

Client: Sterigenics - Queensbury

Column: 1% SP-1000, Carbopack B

0.483

3.9085

5.7695

9.3004 ppm

9.3004

Temp. prog: eto-100.tem Temp. prog: eto-100.tem Components: eto1-100.cpt Components: eto2-100.cpt Data file: 2SterQ2017-3A07.CHR (c:\peak359) Data file: 1SterQ2017-3A07.CHR (c:\peak359) Sample: Abator Inlet Sample: Abator Outlet Operator: D. Kremer Operator: D. Kremer -1.600 16.000 -6.400 64.000 5.4140/0.083 Dead Vol / Air 0.0000/ 1.7805/0.216 0.0000/ Ambient H2O 0.0000/ 9.1779/ppm

Component

Dead Vol / Air

Ambient H2O

External Units

9.1779 ppm

0.0000

9.1779

Client: Sterigenics - Queensbury

Column: 1% SP-1000, Carbopack B

Retention

0.083

0.350

Area

25.4140

132.6885

158.1025

External Units

0.0000

0.0000

0.0000

Client ID: Run#3Aer

Carrier: HELIUM

Analysis date: 10/24/2017 12:19:18

Method: Direct Injection

Description: CHANNEL 2 - PID

Lab Haille. Loci

Client ID: Run#3Aer

Carrier: HELIUM

Component

Dead Vol / Air

Ethylene Oxide

Analysis date: 10/24/2017 12:19:18

Method: Direct Injection

Description: CHANNEL 1 - FID

Client: Sterigenics - Queensbury

Column: 1% SP-1000, Carbopack B

Retention

0.216

0.466

Area

1.7805

3.8570

5.6375

Components: eto1-100.cpt Components: eto2-100.cpt Data file: 2SterQ2017-3A08.CHR (c:\peak359) Data file: 1SterQ2017-3A08.CHR (c:\peak359) Sample: Abator Inlet Sample: Abator Outlet Operator: D. Kremer Operator: D. Kremer -1.600 16.000 -6,400 64.000 Component External/Units 23.0900/0.050 0.00007 Dead Vol / Air 1.8450/0.216 0.0000/ 135.7875/0,350 Ambient H2O Component Retention Area External Units Component Retention Area External Units

Dead Vol / Air

Ambient H2O

Client: Sterigenics - Queensbury

Column: 1% SP-1000, Carbopack B

0.050

0.350

23.0900

135.7875

158,8775

0.0000

0.0000

0.0000

Client ID: Run#3Aer

Carrier: HELIUM

Temp. prog: eto-100.tem

Analysis date: 10/24/2017 12:24:03

Method: Direct Injection

Description: CHANNEL 2 - PID

Client: Sterigenics - Queensbury

Column: 1% SP-1000, Carbopack B

0.216

0.466

1.8450

3.9490

5.7940

0.0000

9.3968

9.3968 ppm

Client ID: Run#3Aer

Carrier: HELIUM

Temp. prog: eto-100.tem

Dead Vol / Air

Ethylene Oxide

Analysis date: 10/24/2017 12:24:03

Method: Direct Injection

Description: CHANNEL 1 - FID

Components: eto2-100.cpt Components: eto1-100.cpt Data file: 1SterQ2017-3A09.CHR (c:\peak359) Data file: 2SterQ2017-3A09.CHR (c:\peak359) Sample: Abator Inlet Sample: Abator Outlet Operator: D. Kremer Operator: D. Kremer 16.000 64.000 -1.600 -6.400 21.7760/0.116 Dead Vol / Air 0.0000/ ead Vol/Air 1.8280/0.216 Ambient H2O 134.8745/0.333 0.0000/ 3.9120/0.450 9.3087/ppm ithylene Oxide

Component

Dead Vol / Air

Ambient H2O

Harris, Loui

Client ID: Run#3Aer Analysis date: 10/24/2017 12:29:03

Carrier: HELIUM

Temp. prog: eto-100.tem

Method: Direct Injection

Description: CHANNEL 2 - PID

Client: Sterigenics - Queensbury

Column: 1% SP-1000, Carbopack B

Retention

0.116

0.333

Area

21.7760

134.8745

156.6505

External Units

0.0000

0.0000

0.0000

Harrio.

Client ID: Run#3Aer

Carrier: HELIUM

Temp. prog: eto-100.tem

Component

Dead Vol / Air

Ethylene Oxide

Analysis date: 10/24/2017 12:29:03 Method: Direct Injection

Description: CHANNEL 1 - FID

Client: Sterigenics - Queensbury

Column: 1% SP-1000, Carbopack B

Retention

0.216

0.450

Area

1.8280

3.9120

5.7400

External Units

9.3087 ppm

0.0000

9.3087

Data file: 1SterQ2017-3A10.CHR (c:\peak359) Data file: 2SterQ2017-3A10.CHR (c:\peak359) Sample: Abator Inlet Sample: Abator Outlet Operator: D. Kremer Operator: D. Kremer -1.600 16.000 64.000 External/Units 10.0000/Units 21.7025/0.000 1.8385/0.233 Dead Vot / Air 133,2710/0,350 Ambient H2O 0.0000/ thylene Oxide Component Retention Area External Units Component Retention Area External Units

Ambient H2O

Lab Hairio. Loci

Client ID: Run#3Aer

Carrier: HELIUM

Temp. prog: eto-100.tem

Components: eto2-100.cpt

Analysis date: 10/24/2017 12:34:25

Method: Direct Injection

Description: CHANNEL 2 - PID

Client: Sterigenics - Queensbury

Column: 1% SP-1000, Carbopack B

0.350

133.2710

133.2710

0.0000

0.0000

Lab Haille. Looi

Client ID: Run#3Aer

Carrier: HELIUM

Temp. prog: eto-100.tem

Components: eto1-100.cpt

Dead Vol / Air

Ethylene Oxide

Analysis date: 10/24/2017 12:34:25

Method: Direct Injection

Description: CHANNEL 1 - FID

Client: Sterigenics - Queensbury

Column: 1% SP-1000, Carbopack B

0.233

0.466

0.0000

9.2909

9.2909 ppm

1.8385

3.9045

5.7430

Components: eto2-100.cpt Components: eto1-100.cpt Data file: 1SterQ2017-3A11.CHR (c:\peak359) Sample: Abator Inlet Data file: 2SterQ2017-3A11.CHR (c:\peak359) Sample: Abator Outlet Operator: D. Kremer Operator: D. Kremer 64.000 External/Units 16.000 -6.400 -1.600 0.6150/0.133 0.0000/ Dead Vol / Air 1.8270/0.216 0.0000/ 0.0000/ Ambient H2O .3397/ppm Component Retention Area External Units Component Retention Area External Units

Dead Vol / Air

Ambient H2O

Client: Sterigenics - Queensbury

Column: 1% SP-1000, Carbopack B

0.216

0.466

1.8270

3.9250

5.7520

0.0000

9.3397

9.3397 ppm

Client ID: Run#3Aer

Carrier: HELIUM

Temp. prog: eto-100.tem

Dead Vol / Air

Ethylene Oxide

Analysis date: 10/24/2017 12:39:07

Method: Direct Injection
Description: CHANNEL 1 - FID

Client: Sterigenics - Queensbury

Column: 1% SP-1000, Carbopack B

0.133

0.350

20.6150

130.7905

151.4055

0.0000

0.0000

0.0000

Client ID: Run#3Aer

Carrier: HELIUM

Temp. prog: eto-100.tem

Analysis date: 10/24/2017 12:39:07

Method: Direct Injection

Description: CHANNEL 2 - PID

Temp. prog: eto-100.tem Components: eto2-100.cpt Data file: 1SterQ2017-3A12.CHR (c:\peak359)
Sample: Abator Inlet Data file: 2SterQ2017-3A12.CHR (c:\peak359) Sample: Abator Outlet Operator: D. Kremer Operator: D. Kremer 64.000 External/Units 16.000 -6.400 -1.600 Dead Vol / Air 19.8280/0.100 0.0000/ 1.8635/0.216 ก ดอดดง 0.0000/ Ambient H2O Component Retention Area External Units Component Retention Area External Units

Dead Vol / Air

Ambient H2O

Client: Sterigenics - Queensbury

Column: 1% SP-1000, Carbopack B

0.216

0.466

1.8635

3.8090

5.6725

0.0000

9.0636

9.0636 ppm

Client ID: Run#3Aer

Carrier: HELIUM

Temp. prog: eto-100.tem Components: eto1-100.cpt

Dead Vol / Air

Ethylene Oxide

Analysis date: 10/24/2017 12:44:07 Method: Direct Injection

Description: CHANNEL 1 - FID

Client: Sterigenics - Queensbury

Column: 1% SP-1000, Carbopack B

0.100

0.333

19.8280

135.5945

155.4225

0.0000

0.0000

0.0000

Client ID: Run#3Aer

Carrier: HELIUM

Analysis date: 10/24/2017 12:44:07

Method: Direct Injection

Description: CHANNEL 2 - PID

## **APPENDIX H**

**Field Data and Calculation Worksheets** 



# ECSi, Inc. Ethylene Oxide Mass Emissions Data and Calculations

## Sterigenics U.S., LLC. - Queensbury, New York 10/24/17 - Backvent Runs 1-3

<u>DeltaP</u>	<u>SqRtDeltaP</u>	Temp (F)	ppm EtO	mw =	28.51	
	Run			stack area =	3.14	
0.29	0.5385	200	0.01	press =	29.75	
0.29	0.5385	200	0.01	Tstd =	528	
0.29	0.5385	200	0.01	Pstd =	29.92	
0.29	0.5385	200	0.01	Cp =	0.99	
0.29	0.5385	200	0.01	Kp =	85.49	
0.29	0.5385	200	0.01			
0.29	0.5385	201	0.01	Velocity =	40.2	ft/sec
0.29	0.5385	201	0.01	Flow =	5839	dscfm
0.29	0.5385	201	0.01			
0.29	0.5385	201	0.01	MWeto =	44.05	
0.29	0.5385	201	0.01	MolVol =	385.32	
0.29	0.5385	201	0.01	ppmv/ft3 =	1000000	
	Run					
0.29	0.5385	201	0.01	EtO Mass Flow =	0.000007	lbs/min
0.29	0.5385	201	0.01	EtO Mass Flow =	0.000400	lbs/hr
0.29	0.5385	201	0.01			
0.29	0.5385	201	0.01			
0.29	0.5385	201	0.01			
0.29	0.5385	201	0.01			
0.29	0.5385	201	0.01			
0.29	0.5385	202	0.01			
0.29	0.5385	202	0.01			
0.29	0.5385	202	0.01			
0.29	0.5385	202	0.01			
0.29	0.5385	203	0.01			
	Run					
0.29	0.5385	202	0.01			
0.29	0.5385	202	0.01			
0.29	0.5385	202	0.01			
0.29	0.5385	202	0.01			
0.29	0.5385	202	0.01			
0.29	0.5385	202	0.01			
0.29	0.5385	202	0.01			
0.29	0.5385	202	0.01			
0.29	0.5385	202	0.01			
0.29	0.5385	202	0.01			
0.29	0.5385	202	0.01			
0.29	0.5385	202	0.01			
Average =						
0.29	0.5385	201.3	0.0100			
		004	L. D			

degR

661

# ECSi, Inc. Ethylene Oxide Mass Emissions Data and Calculations

## Sterigenics U.S., LLC. - Queensbury, New York 10/24/17 - Aeration Runs 1-3

<u>DeltaP</u>	<b>SqRtDeltaP</b>	Temp (F)	ppm EtO	mw =	28.51	
	Run	#1		stack area =	3.14	
0.29	0.5385	200	0.01	press =	29.75	
0.29	0.5385	201	0.01	Tstd =	528	
0.29	0.5385	201	0.01	Pstd =	29.92	
0.29	0.5385	201	0.01	Cp =	0.99	
0.29	0.5385	201	0.01	Kp =	85.49	
0.29	0.5385	201	0.01			
0.29	0.5385	201	0.01	Velocity =	40.3	ft/sec
0.29	0.5385	201	0.01	Flow =	5837	dscfm
0.29	0.5385	202	0.01			
0.29	0.5385	202	0.01	MWeto =	44.05	
0.29	0.5385	202	0.01	MolVol =	385.32	
0.29	0.5385	202	0.01	ppmv/ft3 =	1000000	
	Run					
0.29	0.5385	202	0.01	EtO Mass Flow =	0.000007	lbs/min
0.29	0.5385	201	0.01	EtO Mass Flow =	0.000400	lbs/hr
0.29	0.5385	201	0.01			
0.29	0.5385	201	0.01			
0.29	0.5385	201	0.01			
0.29	0.5385	201	0.01			
0.29	0.5385	201	0.01			
0.29	0.5385	201	0.01			
0.29	0.5385	201	0.01			
0.29	0.5385	201	0.01			
0.29	0.5385	201	0.01			
0.29	0.5385	201	0.01			
0.00	Run		0.04			
0.29	0.5385	203	0.01			
0.29	0.5385	203	0.01			
0.29	0.5385	203	0.01			
0.29	0.5385	203	0.01			
0.29	0.5385	203	0.01			
0.29 0.29	0.5385	203 203	0.01			
0.29	0.5385 0.5385	203	0.01 0.01			
0.29	0.5385	203	0.01			
0.29	0.5385	203	0.01			
0.29	0.5385	203	0.01			
0.29	0.5385	203	0.01			
0.23	0.0000	200	0.01			
Average =						
0.29	0.5385	201.8	0.0100			
3.20	0.000	_00	0.0.00			

degR

662

# ETHYLENE OXIDE SOURCE TEST/CALIBRATION DATA

Juice 16	ested: <u>Cercote</u>	- · · · /	(A) N.	1					,
	Yonald	500 B	to po	atol			<del></del>		
	<u> </u>		PR	E CALI	BRATI	ON			
	Calibration Gas Conc. (ppmv)	1.10 ppm EtO	10.1 ppm EtO	100 ppm EtO	1000 ppm EtO	10080 ppm EtO			
Inlet	Area Counts #1	.459	4.25	43.2					
(FID)	Area Counts #2	.442	4.33	42.0					
	Average Area	1.451	4.29	42.6			<b>&gt;</b>		
		Aud	it Standard	l (48.8 ppm	v) Result	49.91			
	Calibration Gas Conc. (ppmv)	1.10 ppm EtO	10.1 ppm EtO	100 ppm EtO					
Outlet	Area Counts #1	2.65	23.3	221					
(PID)	Area Counts #2	2.59	24.2	221					
	Average Area	2.62	23.8	221					
				. **					
Glam	Ch. Q ig.  PANO Run #1 1	S3 Ch.3 Run #2	th.\ Run#3	I (48.8 ppm		48.3	EtO Usos	vo (lbo/s).	
h start 1 start 3 star	Ch. Q (G. 1946)  PANO Run #1 1  Stop: 1335 #460  Chop: 1009 1004  Stop: 6845 9945	53 Ch.3	ch.\	P <sub>bar</sub> %H	: 29	148.3 1.15 3	EtO Usaç Cycles P	ge (lbs/yr): er Week:	
h start 1 start 3 star	Ch. Q 19.  PANO Run #1 /  Stop: 1335 #460  Stop: 1009 1004  Stop: 6845 0945	Ch.3 Run #2 2023 2051	Ch. (  Run #3  2)05112  1205112  1205112	P <sub>bar</sub>	: 29 20:	<u>. 15</u> 3			
h start ( start I star	Ch. Q 19 13 13 140 15 100 100 100 100 100 100 100 100 100	Ch.3 Run #2 2023 2051	Ch. (  Run #3  2)05112  1205112  1205112	P <sub>bar</sub>	: 29 20:	<u>. 15</u> 3			
Start Start Start Inlet	Stop: 60 TOWN  Calibration Gas	Ch.3 Run #2 2023 2051 1131 TEV6 1025 TI25	Ch. \ Run #3 2205112 1250 DIS 114524 PO:	P <sub>bar</sub> %H  T  ST CAL  100 ppm	: 20: 20:	7.75 3 ION 10080 ppm			
Start Start Start Inlet (FID)	Calibration Gas Conc. (ppmv)	Ch.3 Run #2 2023 2051 1131 TEV6 1025 TI25	Ch. \ Run #3 2205112 1250 DIS 114524 PO:	P <sub>bar</sub> %H  T  ST CAL  100 ppm	: 20: 20:	7.75 3 ION 10080 ppm			
	Calibration Gas Conc. (ppmv)  Area Counts #1	Ch.3 Run #2 2023 2051 1131 TEV6 1025 TI25	Ch. \ Run #3 2205112 1250 DIS 114524 PO:	P <sub>bar</sub> %H  T  ST CAL  100 ppm	: 20: 20:	7.75 3 ION 10080 ppm			
	Calibration Gas Conc. (ppmv)  Area Counts #1  Area Counts #2	1.10 ppm EtO	Ch. ( Run #3 2202112 1250 BIS 1147 F24  PO: 10.1 ppm EtO	P <sub>bar</sub> %H  T  ST CAL  100 ppm	: 24 20:	7.75 3 ION 10080 ppm EtO	Cycles P	er Week:	
	Calibration Gas Conc. (ppmv)  Area Counts #1  Area Counts #2	1.10 ppm EtO	Ch. ( Run #3 2202112 1250 BIS 1147 F24  PO: 10.1 ppm EtO	P <sub>bar</sub> %H ST CAL 100 ppm EtO	: 24 20:	7.75 3 10 N 10080 ppm EtO	Cycles Pro-	er Week:	
	Calibration Gas Conc. (ppmv)  Area Counts #1  Area Counts #2  Average Area  Calibration Gas	1.10 ppm EtO  Aud  1.10	PO:  10.1 ppm EtO  10.1 ppm EtO	P <sub>bar</sub> %H 100 ppm EtO  (48.8 ppm) 100 ppm	: 24 20:	7.75 3 10 N 10080 ppm EtO	Cycles Pro-	er Week:	
(FID)	Calibration Gas Conc. (ppmv)  Area Counts #1  Area Counts #2  Average Area  Calibration Gas Conc. (ppmv)	1.10 ppm EtO  Aud  1.10	PO:  10.1 ppm EtO  10.1 ppm EtO	P <sub>bar</sub> %H 100 ppm EtO  (48.8 ppm) 100 ppm	: 24 20:	7.75 3 10 N 10080 ppm EtO	Cycles Pro-	er Week:	

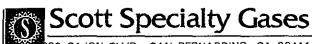
ECSi

## APPENDIX I

**Gas Certifications** 



Single-Certified Calibration Standard



00 CAJON BLVD., SAN BERNARDINO, CA 92411

Phone: 909-887-2571 Fax: 909-887-0549

## CERTIFICATE OF ACCURACY: Certified Working Class Calibration Standard

**Product Information** 

Project No.: 02-57164-001 ltem No.: 02020001310TCL P.O. No.: VBL – D. KREMER

Cylinder Number: CAL4448

Cylinder Size: CL

Certification Date: 18Apr2016

Customer

ECSI, INC PO BOX 848

SAN CLEMENTE, CA 92672

**CERTIFIED CONCENTRATION** 

Component Name

ETHYLENE OXIDE NITROGEN Concentration (Moles)

1.10 PPM

Accuracy (<u>+</u>/-%)

5

BALANCE

TRACEABILITY

Traceable To

Scott Reference Standard

APPROVED BY:	 $\mathcal{M}($	
	 MT	

DATE: 4-18-16\_\_\_\_

Page 1 of 2

SPECIFICATIONS	Requested Concentration	Certified Concentration	Blend Tolerance Resuit	Certified Accuracy Result	
Component Name	(Moles)	(Moles)	(+/- %)_	(+/- %)	
BIHYLENE OXIDE	l. PR		10.0	5.00	

Traceable To Scott Reference Standard

#### PHYSICAL PROPERTIES

Cylinder Size: CL

Pressure:

1300 PSIG

Expiration Date: 18Apr2018

### **SPECIAL HANDLING INSTRUCTIONS**

Do not use or store cylinder at or below the stated dew point temperature. Possible condensation of heavier components could result. In the event the cylinder has been exposed to temperatures at or below the dew point, place cylinder in heated area for 24 hours and then roll cylinder for 15 minutes to re-mix.

Use of calibration standards at or below dew point temperature may result in calibration error.

Single-Certified Calibration Standard



00 CAJON BLVD., SAN BERNARDINO, CA 92411

Phone: 909-887-2571 Fax: 909-887-0549

## CERTIFICATE OF ACCURACY: Certified Working Class Calibration Standard

**Product Information** 

Project No.: 02-57164-003 Item No.: 02020001320TCL P.O. No.: VBL - D. KREMER

Cylinder Number: CLM003232 Cylinder Size: CL Certification Date: 18Apr2016

Customer

ECSI, INC PO BOX 848

SAN CLEMENTE, CA 92672

CERTIFIED CONCENTRATION

Component Name

ETHYLENE OXIDE NITROGEN

Concentration (Moles)

10.1

PPM BALANCE Accuracy (+/-%)

TRACEABILITY

Traceable To

Scott Reference Standard

APPROVED BY:		DATE:	4-18-16
	MT		

SPECIFICATIONS  Component Name	Concent	Requested Concentration (Moles)		Certified Concentration (Moles)		Certified Accuracy Result (+/- %)	· .
ETHYLENE OXIDE	10.	PPM BAL	10.1	PPM BAL	1.0	5.00	

Traceable To Scott Reference Standard

#### PHYSICAL PROPERTIES

Cylinder Size: CL

Pressure: 1400 PSIG

Expiration Date: 18Apr2018

## SPECIAL HANDLING INSTRUCTIONS

Do not use or store cylinder at or below the stated dew point temperature. Possible condensation of heavier components could result. In the event the cylinder has been exposed to temperatures at or below the dew point, place cylinder in heated area for 24 hours and then roll cylinder for 15 minutes to re-mix.

Use of calibration standards at or below dew point temperature may result in calibration error.

## Single-Certified Calibration Standard



Phone: 909-887-2571 Fax: 909-887-0549

## CERTIFICATE OF ACCURACY: Certified Working Class Calibration Standard

Product Information

Project No.: 02-57164-004 Item No.: 02020001330TCL P.O. No.: VBL – D. KREMER

Cylinder Number: CLM011385 Cylinder Size: CL

Certification Date: 18Apr2016

Customer

ECSI, INC PO BOX 848

SAN CLEMENTE, CA 92672

**CERTIFIED CONCENTRATION** 

Component Name

ETHYLENE OXIDE NITROGEN

Concentration (Moles)

100.

PPM BALANCE

5

Accuracy

(+/-%)

**TRACEABILITY** 

Traceable To

Scott Reference Standard

APPROVED BY:

B-Mª Cully

DATE: 4-18-16

Page 1 of 2

SPECIFICATIONS  Component Name	Reque Concent (Mol	ration	Certifi Concent (Mole	ration	Blend Tolerance Result (+/- %)	Certified Accuracy Result (+/- %)	
ETHYLENE OXIDE	100.	PFM BAL	100.	PPM BAL	.0	5.00	

Traceable To

Scott Reference Standard

#### PHYSICAL PROPERTIES

Cylinder Size: CL

Pressure: Expiration Date: 18Apr2018

1400 PSIG

Valve Connection: CGA 350

## SPECIAL HANDLING INSTRUCTIONS

Do not use or store cylinder at or below the stated dew point temperature. Possible condensation of heavier components could result. In the event the cylinder has been exposed to temperatures at or below the dew point, place cylinder in heated area for 24 hours and then roll cylinder for 15 minutes to re-mix.

Use of calibration standards at or below dew point temperature may result in calibration error.

Single-Certified Calibration Standard



Phone: 909-887-2571 Fax: 909-887-0549

## CERTIFICATE OF ACCURACY: Certified Working Class Calibration Standard

**Product Information** 

Project No.: 02-57164-005 Item No.: 02020001340TCL P.O. No.: VBL – D. KREMER

Cylinder Number: CLM002810 Cylinder Size: CL Certification Date: 18Apr2016 Customer

ECSI, INC PO BOX 848

SAN CLEMENTE, CA 92672

**CERTIFIED CONCENTRATION** 

Component Name

ETHYLENE OXIDE NITROGEN Concentration (Moles)

1.000.

PPM BALANCE Accuracy (+/-%)

5

**TRACEABILITY** 

Traceable To-

Scott Reference Standard

APPROVED BY:

BLM

DATE: 4-18-16

Page 1 of 2

SPECIFICATIONS  Component Name	Requested Concentration (Moles)		Certifi Concent (Mol	tration	Blend Tolerance Result (+/- %)	Certified Accuracy Result (+/- %)	
ETHYLENE OXIDE	1,000.	PPM BAL	1,000.	PPM BAL	.0	5.00	

Traceable To Scott Reference Standard

#### PHYSICAL PROPERTIES

Cylinder Size: CL

Pressure:

1300 PSIG

Valve Connection: CGA 350

Expiration Date: 18Apr2018

## SPECIAL HANDLING INSTRUCTIONS

Do not use or store cylinder at or below the stated dew point temperature. Possible condensation of heavier components could result. In the event the cylinder has been exposed to temperatures at or below the dew point, place cylinder in heated area for 24 hours and then roll cylinder for 15 minutes to re-mix.

Use of calibration standards at or below dew point temperature may result in calibration error.

Single-Certified Calibration Standard



Phone: 909-887-2571 Fax: 909-887-0549

## CERTIFICATE OF ACCURACY: Certified Working Class Calibration Standard

**Product Information** 

Project No.: 02-57164-006 Item No.: 02020001340TCL P.O. No.: VBL - D. KREMER

Cylinder Number: CLM005787 Cylinder Size: CL

Certification Date: 18Apr2016

Customer

ECSI, INC **PO BOX 848** 

SAN CLEMENTE, CA 92672

CERTIFIED CONCENTRATION

Component Name

ETHYLENE OXIDE **NITROGEN** 

Concentration (Moles)

10,080.

PPM

BALANCE

Accuracy (+/-%)

5

TRACEABILITY

Traceable To

Scott Reference Standard

APPROVED BY:

DATE: 4-18-16

Page 1 of 2

SPECIFICATIONS  Component Name.	Requested Concentration (Moles)		Concent	Certified Concentration (Moles)		Certified Accuracy Result (+/- %)	
ETHYLENE OXTDE NITROGEN	10,000.	PPM BAL	10,080.	PPM BAL	. 8	5.00	

Traceable To

Scott Reference Standard

## PHYSICAL PROPERTIES

Cylinder Size: CL

Pressure: Expiration Date: 18Apr2018

800 PSIG

Valve Connection: CGA 350

## SPECIAL HANDLING INSTRUCTIONS

Do not use or store cylinder at or below the stated dew point temperature. Possible condensation of heavier components could result. In the event the cylinder has been exposed to temperatures at or below the dew point, place cylinder in heated area for 24 hours and then roll cylinder for 15 minutes to re-mix.

Use of calibration standards at or below dew point temperature may result in calibration error.



### CERTIFICATE OF ANALYSIS

Customer Name:

Stock or Analyzer Tag Number:

Customer Reference: MESA Reference:

Date of Certification:

Recommended Shelf Life:

ECSi, Inc.

N/A

Verbal- Dan

104448 4/20/2016

2 Years

Cylinder Number:

**Product Class:** 

Cylinder - Contents<sup>1</sup>:

Cylinder-CGA: Analysis Method:

Preparation Method:

SA25925

Certified Standard

28 CF @ 2000 PSI

A006-HP-BR/350

GC-TCD/FID Gravimetric

Component

Ethylene Oxide

Nitrogen

Requested Concentration<sup>2</sup>

> 50 ppm Balance

Reported Concentration<sup>2,3</sup>

48.8 ppm Balance

Authorized Signature:

1. The fill pressure shown on the COA is as originally quoted. The fill pressure measured by the customer may differ from the fill pressure originally quoted due to temperature effects, compressibility of the individual components when blended together in the cylinder, gauge accuracy or reduction in content volume before shipping as a result of samples withdrawn for laboratory QC necessary to ensure product quality.

2. Unless otherwise stated, concentrations are given in molar units.

3. Vapor pressure mixes are blended at a sufficiently low pressure so as to eliminate phase separation under most low temperature conditions encountered during transport or storage. However, it is generally recommended that cylinders containing vapor pressure restricted mixes be placed on the floor in a horizontal position and rolled back and forth to improve homogeneity of the gas phase mixture before being put into service.

Analytical Gas Standards are prepared and analyzed using combinations of NIST traceable weights, SRM's provided by NIST, or internal gas standards that have been verified for accuracy using procedures published by the US-EPA. Pure gases are analyzed and certified for purity using minor component Analytical Gas Standards prepared according to the methods specified above. Balances are calibrated to NIST test weights covered by NIST test number 822/256175/96. Reference Certification #'s: 163/W, 830/N and 3280. Calibration methods are in conformance with MIL-STD 45662A.

MESA Specialty Gave & Equipment division of MESA International Technologies, Inc.
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